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### THE EPIDEMIOLOGY OF "Q" FEVER: A REVIEW.<sup>1</sup>

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WHEN in 1944 I wrote on the epidemiology of "Q" fever, my information was derived almost entirely from Queensland. Since then a flood of data has poured in from many countries. There have been explosive outbreaks and there are areas of quiet endemicity. New information as it arose has often been confusing, for the conclusions derived from one outbreak may be quite different from those from another. The history of "Q" fever is full of paradoxes and surprises and changes of emphasis.

In Queensland, "Q" fever began as a human disease, and infected ticks were found only after deliberate search. In America, infected ticks were found first and for years human cases were exceptional. Ticks seem an important potential source of infection, yet not one in a hundred patients has had contact with them.

Quite a new aspect appeared with the discovery of the agent of "Q" fever in the milk of cows and goats. This was

the sort of thing a Brucella would do, but unheard-of behaviour for a Rickettsia. In keeping was the occurrence in Switzerland of a disastrous epidemic of abortion in goats.

From observations in Queensland an outstanding conclusion was the significance for human infection of association with cattle, and this conclusion was confirmed in southern California and elsewhere. And then a large number of cases of "Q" fever occurred in northern California, where the association is rather with sheep and goats; that holds also in Greece. Still other outbreaks have had no obvious association with any animal.

There have been many curious episodes. England broke new ground with an outbreak centred in the autopsy room; two pathologists and a mortuary attendant were affected (Marmion and Stoker, 1950). The record was later eclipsed in Florence, where 16 of the 18 doctors and students who attended an autopsy developed "Q" fever (Babudieri, 1951). Explosive outbreaks have occurred in Switzerland in such varied locales as a locksmith's workshop, a recruits' school, a furniture factory and a mental hospital. Seamen have become infected in mid-Pacific from their cargo of goats (Clark, Lennette and Romer, 1951a), and workers at a rendering plant, apparently from the discarded carcasses of experimental guinea-pigs (Feldman *et alii*, 1950).

"Q" fever hits back at those who would attack it. About 200 laboratory infections have been recorded.

<sup>1</sup>Read at a meeting of the Section of Public Health, Industrial Medicine, Tropical Medicine and Aviation Medicine, Australasian Medical Congress (British Medical Association), Eighth Session, Melbourne, August 22 to 29, 1952.

A full picture of the epidemiology of "Q" fever would integrate into one clear pattern all this wealth of diverse and often confusing observations. That I cannot hope to achieve. My approach will be the asking of three questions: What are the natural sources of *Coxiella burnetii*? What are the intermediary steps by which it reaches man? What are the portals of entry into man?

#### The Sources of *Coxiella burnetii* in Nature.

##### Ticks.

In the search for natural sources of *Coxiella burnetii* and for its possible vectors investigation of ticks has been most informative. At least 17 species of ticks have been found naturally infected (Table I). The list is impressive and is doubtless far from complete. The species represent eight genera and both tick families. They come from widely separated localities and from four continents.

TABLE I.  
Ticks Found Naturally Infected with *Coxiella burnetii*.

Tick.	Relevant Host.	Country.	Authority.
Ixodidae:			
<i>Amblyomma americanum</i>	Goat, cow, dog.	U.S.A.	Parker and Kohls (1943).
<i>Amblyomma variegatum</i>	Buffalo.	French Equatorial Africa.	Blanc, Bruneau and Chabaud (1950).
<i>Dermacentor andersoni</i>		U.S.A.	Davis and Cox (1938).
<i>Dermacentor occidentalis</i>		U.S.A.	Cox (1940).
<i>Hemaphysalis humerosa</i>	Bandicoot.	Queensland.	Smith and Derrick (1940).
<i>Hemaphysalis leachi</i>	Dog, cattle.	Congo.	Giroud and Jadin (1950a).
<i>Hemaphysalis leporispalustris</i>	Rabbits.	U.S.A.	Parker, Bell and Stoenner (1949).
<i>Hyalomma dromedarii</i>	Dromedary.	Morocco.	Blanc, Bruneau et alii (1948a).
<i>Hyalomma excavatum</i>		Spain.	De Prada et alii (1950).
<i>Hyalomma excavatum lusitanicum</i>	Merion.	Morocco.	Blanc, Bruneau et alii (1948a).
<i>Hyalomma marginatum</i> <sup>1</sup>	Calif.	Spain.	Perez Gallardo et alii (1949).
<i>Hyalomma mauretanicum</i>	Bovines.	Algeria.	Blanc and Bruneau (1949).
<i>Hyalomma savignyi</i> <sup>1</sup>	Goat, sheep, merion.	Morocco.	Blanc et alii (1947).
<i>Hyalomma savignyi</i> <sup>1</sup>	Sheep.	Spain.	Parker, de Prada et alii (1949).
<i>Ixodes dentatus</i>	Rabbits.	U.S.A.	Parker, Bell and Stoenner (1949).
<i>Ixodes ricinus</i>	Dog.	Germany.	Hengel et alii (1950).
<i>Rhipicephalus bursa</i>	Calif.	Spain.	Perez Gallardo et alii (1949).
<i>Rhipicephalus sanguineus</i>	Dog.	U.S.A.	Parker and Susman (1949).
<i>Rhipicephalus sanguineus</i>		Morocco.	Pasteur Institute, Morocco (1948).
<i>Rhipicephalus sanguineus</i>	Dormouse.	Spain.	Perez Gallardo et alii (1949).
Argasidae:			
<i>Ornithodoros moubata</i>	Cattle.	Congo.	Jadin (1951).
<i>Otobius megnini</i>		U.S.A.	Jellison et alii (1948a).

<sup>1</sup> Delpy (1949) states that *Hyalomma marginatum* is a synonym of *H. savignyi* and that *H. mauretanicum* is a synonym of *H. detritum* (Ann. parasitol., hum. & comp., 24: 464).

In the laboratory also ticks have repaid study. At least nine species (including four of those mentioned in Table I) have been found able to transmit *C. burnetii* from host to host under experimental conditions (Table II).

A further five species have been experimentally infected by feeding on infected hosts (Table III). The readiness with which ticks may be infected with *C. burnetii* is notable. *Ornithodoros* species may conveniently be used for maintaining *C. burnetii* in the laboratory, and the feeding of *O. moubata* on suspected patients has even been used as a method of diagnosis (Nauck and Weyer, 1949; Burgdorfer, 1951).

When ingested by a tick, *C. burnetii* may multiply enormously. Smith (1940) showed with *Hemaphysalis humerosa* that multiplication takes place within the epithelial cells lining the intestine, and that the lumen also contains numerous rickettsiae. Tick and tick faeces are among the most, probably the most, concentrated natural

sources of *C. burnetii*. One gramme of crushed ticks may contain  $10^{12}$  infective guinea-pig doses and one gramme of tick faeces  $10^{10}$  doses (Table IV). Concentrations approaching these— $10^8$  and  $10^9$ —have, however, been recorded for sheep and cow placenta.

With three ticks transovarial passage of *C. burnetii* has been demonstrated: *Dermacentor andersoni* (by Parker and Davis, 1938) *Ornithodoros moubata* (by Davis, 1943) and *Hyalomma* species (by Blanc et alii, 1948a). There is suggestive evidence also with *Hemaphysalis humerosa* (Smith, 1940). The transmission of rickettsiae from the adult tick through the ova to the ticks of the next generation is important, for it allows the tick to be a self-perpetuating reservoir of infection.

TABLE II.

Ticks by Which *Coxiella burnetii* has been Experimentally Transmitted to a Mammalian Host.

Tick.	Host Infected from Tick.	Country.	Authority.
Ixodidae:			
<i>Amblyomma cajennense</i>	Guinea-pig.	Panama.	De Rodaniche (1949).
<i>Dermacentor andersoni</i>	Guinea-pig.	U.S.A.	Parker and Davis (1938).
<i>Hemaphysalis bispinosa</i>	Guinea-pig.	Queensland.	Smith (1942b).
<i>Hemaphysalis humerosa</i>	Guinea-pig.	Queensland.	Smith (1940).
<i>Hyalomma rufipes glabrata</i>	Guinea-pig, sheep.	Portugal.	Fonseca et alii (1951).
<i>Ixodes holocyclus</i>	Bandicoot.	Queensland.	Smith (1942a).
<i>Rhipicephalus sanguineus</i>	Guinea-pig.	Queensland.	Smith (1941).
Argasidae:			
<i>Ornithodoros hermsi</i>	Guinea-pig.	U.S.A.	Davis (1943).
<i>Ornithodoros moubata</i>	Guinea-pig.	U.S.A.	Davis (1943).

Apart from ticks, no other arthropod except the body louse has been found naturally infected with *C. burnetii*. (Infected body lice were found by Giroud and Jadin (1950b) on people in a Congo district, where an epidemic of "Q" fever had occurred three to four months previously.) Only ticks have been found capable of the transfer of *C. burnetii* from host to host, although certain insects (house flies, human lice, bed bugs, mouse fleas, grain weevils) have been infected in the laboratory (Philip, 1948; Weyer, 1950). It may also be noted that, in the investigation of outbreaks, mites have occasionally come under suspicion, but in no case has their infectivity been established.

TABLE III.

Ticks Which have been Experimentally Infected with *Coxiella burnetii* (Other than Those Mentioned in Tables I and II).

Tick.	Host from Which Infected.	Country.	Authority.
Ixodidae:			
<i>Boophilus annulatus</i>	Cow.	Queensland.	Derrick et alii (1942).
<i>microplus</i>			
Argasidae:			
<i>Ornithodoros erraticus</i>	Guinea-pig.	Morocco.	Blanc et alii (1946).
<i>Ornithodoros</i> species, probably <i>gurneyi</i> .	Guinea-pig.	Queensland.	Smith (1942b).
<i>Ornithodoros lahorensis</i>	Guinea-pig.	Turkey.	Payzin (1948).
<i>Ornithodoros turicata</i>	Guinea-pig.	U.S.A.	Davis (1940).

Ticks, then, provide a high-titre, geographically widespread reservoir of *C. burnetii*. Their hosts assist them, either by taking part in a tick-animal-tick cycle of transmission or, where transovarial passage occurs in the tick, simply as accessories necessary for their nourishment. The hosts also, by providing transport, ensure a wide dissemination of infection.

In spite of this background importance, ticks have very little direct association with human infection.

##### Animals and Birds.

The search for naturally infected animals and birds has resulted in the isolation of *C. burnetii* from six species—cow, sheep, goat, bandicoot, merion, pigeon (Table V).

Serological methods have confirmed these results and have also demonstrated antibodies in a number of other species. No doubt future investigations will greatly extend the list, for many species have been found susceptible to experimental infection.

Only one isolation of *C. burneti* from a bird—a San Marino pigeon—has come to notice, but there are several reports from Italy suggesting an association between pigeons and human cases of "Q" fever (Robbins, Gauld and Warner, 1946; Babudieri, 1951).

The bandicoot (an Australian marsupial) and the merion (a Moroccan rodent) are hosts of ticks that have been found naturally infected. Their infection is a parallel phenomenon to that of the ticks, and likewise has little direct relation to human infection. The three domestic animals, on the other hand, are highly significant in this respect.

TABLE IV.  
Some Records of the Concentration of *Coxiella Burneti* in Various Tissues.<sup>1</sup>

Tissue.	Highest Dilution Infective for Guinea-Pigs.	Authority.
Ticks:		
Adult <i>Dermacentor Andersoni</i> .	$10^{-11.7}$	Cox (1940).
Nymphal <i>Dermacentor Andersoni</i> .	$10^{-8}$ to $10^{-12}$	Philip (1948).
Tick faeces:		
Adult <i>Dermacentor Andersoni</i> .	$10^{-9}$ to $10^{-10}$	Philip (1948).
Adult <i>Rhipicephalus sanguineus</i> .	$10^{-8}$	Smith (1941).
Placenta:		
Cow .. .. .	$10^{-2}$ to $10^{-8}$	Luoto and Huebner (1950).
Sheep .. .. .	$10^{-1}$ to $10^{-9}$	Welsh <i>et alii</i> (1951).
Cows' milk .. .. .	Not more than $10^{-3}$ , usually $10^{-2}$ to $10^{-3}$	Huebner and Bell (1951).
Yolk sac .. .. .	$10^{-11}$ to $10^{-12}$	Marmion <i>et alii</i> (1951).
Mouse:		
Spleen .. .. .	$10^{-8}$	Cox (1940).
Guinea-pig:		
Spleen .. .. .	$10^{-6}$	Lennette <i>et alii</i> (1952).
Blood .. .. .	$10^{-4}$	Dyer <i>et alii</i> (1940).
		Cox (1940).
		Cox (1940).

<sup>1</sup> Because of the fewness of recorded titrations, and because of the use of varying doses in estimating infectivity for guinea-pigs, only tentative conclusions can be drawn as to the relative infectivity of the different tissues.

A striking feature of "Q" fever in cows, sheep and goats is that the infectivity resides mainly in the milk and placenta. This has been widely confirmed. An infected cow usually remains well and its milk production unimpaired, but the milk may contain rickettsiae for months. After experimental infection in cows, more often in sheep and goats, an acute phase with rickettsæmia may precede the localization in mammary gland or placenta. Abortion seems to be uncommon in cows (Luoto and Huebner, 1950), more common in goats.

Placental tissue has been found infective in very high dilutions, even to  $10^{-8}$  and  $10^{-9}$  (Table IV). If it is assumed that the rickettsiae were evenly distributed through these placenta, it is interesting to contemplate the development of such concentrations within an intact uterus without causing general symptoms and without harming the fetus. Perhaps there was multiplication of rickettsiae in these placenta after their separation. The infectivity of milk is of a much lower order.

Examination of the urine and faeces of naturally infected domestic animals has given variable results. Many observers have found them uninfected, but occasional positive results have been reported. Bell, Parker and Stoenner (1949) found the faeces infective in calves fed on infected milk, and Lennette and Clark (1951) found the urine and faeces infective in some experimentally infected sheep.

Thus the cow, sheep and goat provide a notable source of infection for their environment—periodically and inten-

sively through placenta and post-partum discharges, more continuously at a lower titre through milk, probably from time to time through faeces and urine, and possibly through sputum. The extent of the reservoir of *C. burneti* in domestic animals in endemic areas may be considerable. Around Athens, for example, the incidence of infection among goats appears to be high (Caminopetros, 1948) and, in southern California a serological survey by Luoto *et alii* (1952) showed that 15% of 120,000 dairy cattle were infected. It is not surprising, therefore, that many human cases of "Q" fever have occurred among those who are associated with these animals.

How do animals become infected? Ticks are the obvious explanation for bush animals and may perhaps be responsible for infection of domestic animals under certain conditions of time and place. However, in California Lennette *et alii* (1952) report that "all the field studies from this

TABLE V.  
Naturally Infected Animals and Birds from which *Coxiella Burneti* has been Isolated.

Animal.	Infected Tissue or Fluid <i>et cetera</i> .	Country.	Authority.
Cow .. .. .	Milk. Milk. Milk (zebu). Mammary gland. Placenta.	U.S.A. England. Congo. U.S.A.	Huebner <i>et alii</i> (1948). MacCallum <i>et alii</i> (1949). Giroud and Jadin (1950a). Jellison <i>et alii</i> (1948c).
Sheep .. .. .	Urine. Milk. U.S.A. Placenta. "Excreta."	U.S.A. Switzerland. Greece. U.S.A. U.S.A.	Luoto and Huebner (1950). Burgdorfer <i>et alii</i> (1951). Caminopetros (1948). Lennette <i>et alii</i> (1949). Welsh <i>et alii</i> (1951). Clark, Bogucki <i>et alii</i> (1951).
Goat .. .. .	Milk. Milk. Placenta.	Greece. U.S.A. Switzerland.	Caminopetros (1948). Lennette <i>et alii</i> (1949). Kilchspurger and Wiesmann (1949).
Bandicoot ( <i>Isodon torosus</i> ).	Brain, spleen. Liver, spleen, kidney.	Congo. Queensland.	Giroud and Jadin (1950a). Derrick and Smith (1940).
Merion ( <i>Merionis shawi</i> ).	Spleen.	Morocco.	Blanc <i>et alii</i> (1947).
Pigeon .. .. .	Kidney.	Italy.	Babudieri and Moscovici (1952).

laboratory have pointed away from arthropods as being responsible for the dissemination of *Coxiella burneti* among domestic livestock". In the Los Angeles area there is certainly some active mechanism of infection at work, for "clean" cows coming into tick-free dairy herds are very liable to become infected within three or four months. Some possible factors in this mechanism will be referred to below.

#### Man as Source of Infection.

In the earlier reports instances suggesting case-to-case infection were extremely rare or absent, although Caminopetros in 1948 had pointed out the significance of the presence of *C. burneti* in sputum. However, in the year 1950 examples were reported from three countries.

In England a dying man infected a nurse, and Whittick (1950) was able to demonstrate *post mortem* enormous numbers of rickettsiae in the pulmonary alveoli. In Los Angeles a patient infected a nurse and two male attendants (Deutsch and Peterson, 1950).

The most striking example came from a hospital in Frankfurt (Siegert *et alii*, 1950). "Q" fever broke out first in one ward and nineteen days later in another. Altogether there were 38 cases, including two physicians and 18 nurses. At first there was no clue to the source of the infection, but when the disease spread to the second ward a search was made for a connecting link between the wards. Suspicion fell on a man, aged fifty-six years, who had been admitted to the first ward twenty-five days before the outbreak there, and transferred to the second ward sixteen days before its outbreak. No other patient had been transferred at a relevant period.



This patient had had chronic pneumonia, with a febrile period of about eight weeks; "Q" fever had not been suspected. Examination on his sixty-eighth day of illness, the temperature then being "subfebrile", showed that his serum reacted strongly to the complement fixation test and that his copious sputum, but not his blood or urine, contained *C. burneti*. The infectivity of the sputum continued until the 141st day. No doubt his sputum had contained *C. burneti* also during his febrile period, which corresponded to the period when the ward infections had arisen. That this man had brought the infection to the hospital received a surprising confirmation. It was found that, for a period of twenty-four days ending sixty days before his illness began, he had undertaken mouse passage of a Balkan strain of *C. burneti* in a laboratory in another city.

Most patients with "Q" fever have pneumonitis, and no doubt some rickettsiae in the alveolar exudate, yet droplet infection from them is extremely rare. However, these three examples show that an occasional patient is definitely infective for his contacts. In the Frankfurt outbreak the difficulty in detecting the source suggests that perhaps some unexplained outbreaks may have been due to an unsuspected human carrier. A point of note, however, is that none of these three human sources were ambulatory; all were past middle life (seventy-eight, fifty-five and fifty-six years), and severely ill, one fatally.

The presence of *C. burneti* in the urine of patients seems to carry little risk of infection to others.

#### Portals of Entry of *Coxiella Burneti* into Man.

The routes of infection to be considered are subcutaneous, intradermal (as by an arthropod), percutaneous, perconjunctival, by ingestion and by inhalation. Experimental animals have been infected by all these routes and several workers have extended the experimental method to man. Mental patients have been inoculated in the twofold hope of curing the mental disease and at the same time gaining information on the method of invasion of *C. burneti*.

Blanc *et alii* (1948b) used the intramuscular, intradermal and respiratory routes and produced infection by them all. Some infections were inapparent. The most convincing results were given by the respiratory route. Two patients, for instance, inhaled for twenty minutes heavily infected suspensions administered by an aerosol apparatus and a gas mask, and developed fever and pulmonary signs. Two operators, although protected by masks, and two non-masked assistants who remained several metres away, also became infected. It is pleasing to add that, for at least one patient, who was infected by nasal instillation, a remarkable therapeutic effect was achieved. He went out cured of his mental troubles.

With regard to the 45 patients inoculated by Fonseca *et alii* (1949), Megaw sums up the results as follows:

Generally speaking no apparent illness was caused by ingestion or intranasal inoculation of the infective material; intradermal inoculation caused a local reaction and sometimes slight general symptoms, especially with yolk-sac material. The naturally occurring disease was closely simulated when subcutaneous injections of yolk-sac material were given.

As regards the development of complement-fixing antibodies:

Occasional slight reactions occurred after nasal inoculation and in most cases of intradermal inoculation titres of 1:20 to 1:160 were reached at some stage. After ingestion the responses were almost consistently negative.

#### Inoculation by Some Blood-Sucking Arthropod.

The only arthropods that need consideration are ticks. Although these are a proved source of *C. burneti* and many of the species found infected attack man, the acquisition of "Q" fever in this way must be extremely rare.

McGurl and Williams (1948) described an American case in which infection followed a tick bite, and in the first

"Q" fever case recorded from Spain the patient removed ten ticks from her body about a fortnight before the onset (De Prada *et alii*, 1950). Such histories are, however, exceptional. In 176 Queensland cases there were only two in which a suggestive history of tick bite was given, in 350 northern Californian cases only one, in 300 southern Californian cases "extremely few", and among many hundreds of recent cases in Italy only one (Babudieri, 1951).

Furthermore, even a clear history of tick bite does not prove that the infection was due to it.

#### Through Unbroken or Abraded Skin.

Guinea-pigs may be infected by the application to the unbroken or to the abraded skin of such highly infectious material as spleens of mice or guinea-pigs and tissues or faeces of ticks. That human infection also may take place by the percutaneous route is suggested by the case described by Eklund *et alii* (1947). A man destroyed the numerous ticks (*Dermacentor andersoni*) that he removed from his clothing by crushing them with his fingers. Sixteen days later he developed "Q" fever.

Perhaps an occasional case has arisen from handling infected animal tissues, such as placenta, mammary gland or the hides of newly born calves. This cannot be a common occurrence. Even at a meatworks these tissues would not be touched by more than a few workers and (I have Brisbane particularly in mind) quite a number of the cases of "Q" fever have been among clerks, mechanics *et cetera*, who do not handle tissue at all. I can recall having my fingers contaminated with infective emulsions on a number of occasions during the course of guinea-pig inoculations, but without ill effect.

Raw milk may also be considered. Huebner and Bell (1951) investigated a group of workers at creameries who were constantly exposed to large amounts of infected milk. Serological evidence of infection in them was seven times as frequent as in the general population, and it was concluded that raw milk can produce "Q" fever in other ways than by ingestion.

To sum up, percutaneous infection may be accepted as possible but rare.

#### Through the Conjunctiva.

If *C. burneti* can penetrate the skin barrier it should be able more easily to penetrate the conjunctiva. There is some experimental evidence of infection in animals by this route, but I have no examples to offer of natural infection in man.

#### Ingestion.

While the distribution of "Q" fever cases in general is not in accord with infection by the oral route, there is strong evidence that occasional cases are due to the ingestion of raw milk.

Of 300 patients in the Los Angeles area, where *C. burneti* is commonly present in the milk, 32% used raw milk, whereas less than 5% of the milk distributed is unpasteurized (Beck *et alii*, 1949). Following up this strong lead, Bell *et alii* (1950) went on to show that the incidence of complement-fixing antibodies (among persons not exposed to livestock) was about ten times as frequent in those who used raw milk as in their immediate neighbours who did not.

There is supporting evidence from other countries. For instance, it seems likely that Patient 5 of Marmion and Stoker (1950), as well as his wife, may have become infected from drinking milk.

Milk, therefore, must be accepted as an occasional vehicle of transmission, but it can explain only a small minority of cases. Of the patients in the Los Angeles area, 68% did not use raw milk, so at least this proportion must have become infected in some other way.

It is possible also that *C. burneti* may sometimes be swallowed with food contaminated by dust or by unwashed hands.



### Inhalation.

The portals of entry so far discussed have accounted for only a very small proportion of cases—perhaps not more than 5% or 10%. This leaves the great majority in which infection appears to have occurred by inhalation. Apart from the experimental demonstration of Blanc *et alii*, the clearest evidence of human air-borne infection comes from the laboratory outbreaks.

In 1945, 20 cases of "Q" fever occurred in the 15th Medical General Laboratory of the American Army in Naples (Robbins and Rustigian, 1946). The infections followed the harvesting and manipulation of heavily infected yolk sacs. All six men in the virus laboratory were affected. When skilled laboratory personnel, who adopt recognized safety precautions, become infected, that alone is strong evidence of air-borne transmission. In this case this conclusion is confirmed by the infection also of 11 others who took no part in the work, but occupied adjacent rooms or from time to time entered the laboratory.

A laboratory outbreak at Fort Bragg reported by the Commission on Acute Respiratory Diseases (1946b) also centred in the egg room, and again there were several features to indicate that infection was air-borne. Of the nine regular workers with eggs, the only two who remained uninfected always wore double face-masks at their work. The victims included two people who worked in nearby rooms, as well as a visitor whose only association with the laboratory was that he observed the harvesting and processing of one group of eggs. Contamination of the air may well have occurred during the grinding of yolk sacs in an open mortar. Marmion *et alii* (1951) confirmed the production of aerosols by such procedures; they recovered *C. burnetii* from air-sampler plates during the mixing of yolk sac suspensions with milk.

While infection by inhalation is demonstrated most clearly in the laboratory outbreaks, it is also consistent with the circumstances of the overwhelming majority of natural infections, and indeed it is the most satisfying explanation of them.

### Pathways of Transmission from Animal to Man.

Two conclusions are evident from what has already been said. Firstly, the important sources of human infection (if we exclude laboratory incidents) are the cow, the sheep and the goat. Secondly, in nearly all cases infection enters man by the respiratory route, the only important exception being a small but definite group due to ingestion of milk. To simplify my remaining task I shall neglect the exceptional modes of transmission and endeavour to trace the pathway of the rickettsia from when it leaves the animal until it is inhaled by man. That pathway may be short and obvious or long and tortuous. Sometimes it is so obscure that it cannot be traced.

### Resistance of *C. Burnetii*.

A fact which may contribute to the obscurity of many routes of transmission is that *C. burnetii* is highly resistant to environmental conditions.

Thus tick faeces may retain their infectivity for 536 days at room temperature (Phillip, 1948), and dried guinea-pig blood for 182 days (Parker, Bell and Stoenner, 1949). Ransom and Huebner (1951) found *C. burnetii* to survive a temperature of 63° C., but not 65° C., for thirty minutes. (Other rickettsiae are inactivated in fifteen minutes at 50° C.). Closely similar results were obtained by Marmion *et alii* (1951) and by Kirberger (1951). The former noted that a more highly infected suspension needed a slightly greater degree of heat for inactivation. *C. burnetii* in milk has been known on occasion to survive pasteurization, and Jellison *et alii* (1948b) found that butter made from unpasteurized cream was still infective to guinea-pigs after forty-one days' refrigeration. Cox (1939) found *C. burnetii* to survive for at least 109 days in cell-free culture media held at 28° C.

*C. burnetii* may therefore survive on contaminated objects for long periods and be transported over long distances or by devious paths to victims quite innocent of contact with livestock.

### Transmission from Close Association with Domestic Animals.

Let me first choose some cases in which there was a close association between domestic animals and the victims of "Q" fever, and in which, therefore, the path of *C. burnetii* from animal to man would be short and direct (Table VI). In slaughterhouse and farmyard there are many opportunities for the projection of droplets or particles into the air and their immediate inhalation.

In an outbreak in Chicago the patients were all employed on the killing floor of a large packing house. Apparently a group of either sheep or young calves—it was not possible to decide between them—brought the infection into the packing house from some unidentified locality. No cases were found in men who handled stock before slaughter or carcasses after dressing.

An outbreak at Amarillo, Texas, occurred over a period of three weeks among employees at a stockyards, a sale-yard and a packing plant. Among the many animals handled at these places the only lot common to the three at the relevant time was a herd of 41 white-faced heifers railed into Amarillo from another part of Texas. The infection of the stock handlers, who worked half a mile from the packing plant, indicates that the heifers were infectious while living. Placentae, milk and ticks can apparently be excluded, which suggests that the excreta of some of the heifers must have been highly infectious.

In the Queensland series, 89% of patients were associated with cattle, either at meatworks or on dairy farms.

In northern California, 69% of patients had more than casual contact with livestock, particularly sheep, and in this area a most illuminating circumstance is the seasonal incidence of "Q" fever. Of the cases, 70% occur in the three spring months of March, April and May. For this there is a ready explanation. In northern California lambing takes place during the winter and early spring only, usually within lambing sheds or circumscribed

TABLE VI.  
Association with Livestock in Some Series of Cases of "Q" Fever.

Locality.	Period.	Number of Cases.	Males. (Per Centum.)	Main Associations.	Authority.
Queensland .. ..	1935 to 1942	176	99	71% were at meatworks. 18% on dairy farms.	Derrick (1944).
Amarillo, Texas ..	March, 1946	55	96	44% as stock handlers, 56% at meatworks, had contact with cattle.	Topping <i>et alii</i> (1947).
Chicago .. ..	August, 1946	33	100	100% at meatworks handled sheep and calves.	Shepard (1947).
Southern California ..	1941 to 1948	300	79	38% had contact with cattle, sheep or goats. 45% lived close to dairies. 32% drank raw milk. 22% had no obvious explanation for infection.	Beck <i>et alii</i> (1949).
Northern California ..	1948 to 1949	350	91	69% had contact with sheep, goats or cattle.	Clark, Lennette and Romer (1951b).
Roumania .. ..	March-April, 1947	9	—	All had shorn sheep two to three weeks before onset.	Combesco <i>et alii</i> (1949).
Trans-Pacific ship ..	April-May, 1949	11	100	All were seamen on a ship carrying goats.	Clark, Lennette and Romer (1951a).

pasturage. It is at this period that the highest degree of contamination of the environment is likely to occur from infected placenta and milk, and it is then that those associated with the sheep will experience their greatest risk of infection.

In Greece also, where the human disease is related to sheep and goats, its epidemic occurrence is strictly seasonal. In southern California and in Queensland, where the relation is with cattle, there is no seasonal preponderance.

In southern California the proportion of patients who had direct contact with livestock was much less than in the other outbreaks listed in Table VI, and two other significant circumstances emerged—ingestion of raw milk, which has already been referred to, and proximity to a dairy. Many patients lived within a quarter of a mile of a dairy or livestock yard, and the significance of this will be discussed below.

Close association with animals is usually occupational, and "Q" fever caught thereby will be almost entirely in males. In those series in Table VI in which the animal association is less frequent, the proportion of female cases is higher.

#### Transmission by Contaminated Clothing.

Let me pass next to instances in which the patient is one degree removed from the source of infection.

Six cases of "Q" fever occurred in laundry employees who handled contaminated clothing from the Rocky Mountain Laboratory (Oliphant *et alii*, 1949). These cases demonstrate that *C. burneti* may survive transport on clothing. The source of infection in these cases was an artificial one, but there is supporting evidence of transmission by clothing from natural sources. There were four cases of "Q" fever in the household of a calf buyer in southern California whose clothes, often soiled with calf excreta, were brought into the house (Beck *et alii*, 1949). A woman in northern California who had an inapparent infection laundered her husband's clothing, which was frequently soiled with the excreta of sheep and cattle (Clark, Lennette and Romer, 1951b). A Brisbane patient was employed in the laundry at a meatworks.

Another instance of indirect infection was that of a husband and wife who lodged a laboratory worker. This worker handled infected eggs, but showed no sign of disease himself. The most reasonable explanation for the two infections is that *C. burneti* was carried from laboratory to home on clothing, shoes, hands or hair (Beeman, 1950).

Such clear examples of transfer of *C. burneti* on inanimate objects are uncommon, but Welsh (1951) invites us to pursue this train of thought further. Why cannot men whose clothing is contaminated carry infection into the shops and offices that they visit and thereby infect the air that shop assistants and office workers inhale? In this way may perhaps be explained some cryptic infections of bartenders, barbers and other indoor workers who have had no direct contact with livestock. Welsh clearly had in mind the outbreak at Colusa, California (Clark, Romer *et alii*, 1951). Few of the 41 patients were directly associated with livestock. Most worked in the business section of the town, and it appeared as if infection was carried to them by persons employed on the nearby sheep ranches.

#### Transmission by Dust.

Dust appears to play a very important part in the spread of "Q" fever.

That dust may be infective was shown by DeLay *et alii* (1951), who isolated *C. burneti* from the dusty atmosphere of a cattle pen in southern California. To obtain the dust, 900 litres of air were passed through an air-sampler, while the surface of the soil was agitated with a broom to simulate the dust-raising movements of the cattle. The fluid used to trap the dust was inoculated into guinea-pigs. The same investigators isolated *C. burneti* from the dust-laden air of a sheep barn and yard in northern California. Lennette and Welsh (1951) isolated it from the air of a milking shed at a goaterie in southern California. Nearly

800 litres of air were sampled, the inlet being 29 centimetres above the litter covering the concrete floor. The use of a broom is not mentioned on this occasion.

These findings demonstrate that where cows, sheep or goats congregate, the surrounding atmosphere may under certain conditions become charged with *C. burneti*.

How may dust become contaminated? In 1944 ticks and tick faeces were the only known natural high-titre sources of infection, and the suggestion was made that tick faeces might be responsible for contamination of the air at a Brisbane meatworks. We must now take into account also placenta and post-partum secretions, milk, urine and faeces, all of which would provide a much greater bulk of infective material than would ticks. The infectivity of urine and faeces is uncertain and variable, and needs further investigation. Milk is not likely to be spilt on the ground of cattle pens, though it might contaminate the hands of milkers and the floors of milking sheds. Suspicion falls strongly on placenta. (I understand that American cows do not eat placenta as Australian cows commonly do.) The infective potential of one placenta is immense. If a bovine placenta weighing four kilograms, and infective to a titre of  $10^{-3}$  could be evenly spread over the ground, there would be enough rickettsiae to infect a guinea-pig for every square millimetre of a hundred-acre field. One such placental bomb could infect a community. The significance of the placenta would apply also to slaughter-floors, although there the contamination of the air would be by droplets, not by dust.

Luoto and Huebner (1950) comment as follows:

The frequency of contamination of dairy environments would appear to depend upon the frequency of parturition and the numbers of infected cows in the dairy herds. In the Los Angeles County milkshed, great numbers of infected cows are concentrated on many dairies, parturitions are frequent, and placentas are allowed to remain on the ground of open corrals. The dry climate in this area, together with the known ability of *C. burneti* to survive desiccation, suggests that infected placentas may provide sporadic but excellent opportunities for the dissemination of viable organisms to the environments of both humans and animals.

The importance of placenta as a source of infection of the environment receives support from experience with sheep in northern California, where the peak of human infection coincides with the lambing season.

By whatsoever means it occurs, the infectivity of dust is highly significant. It provides a ready explanation for the infection by inhalation of dairy workers and others associated with domestic animals. It explains also the risk of residing near a Los Angeles dairy. These dairies were originally established on the outskirts of population, but many have become engulfed by the expansion of the cities and are now surrounded by residences. There may be several hundred cows in a dairy, held and fed in a series of small pens—land is too expensive for pasture. The accumulations of manure are periodically removed by bulldozer and truck and sold as fertilizer. In one dairy visited, each cow is milked three times a day. Cows from each pen in turn are driven into the milking shed, milked and returned to their pen, in a regular sequence throughout the twenty-four hours. The milk is run continuously through the pasteurizing plant and bottled. In the pens and runways the ground is churned up by the many feet, so that the cattle stand ankle-deep in mud in wet weather and in dust in dry weather. As the wind listeth, the germ-laden dust is distributed over the neighbourhood.

The infectivity of the dust of the cattle pens must also be a significant factor in the maintenance of infection in the herds themselves. Not only may the dust be inhaled, but it may also perhaps gain entrance to the teat canal when the cow lies down. Another possible means of maintaining infection in the herd—infection of calves by ingestion of their mothers' milk—would apply only to those herds that supply their own replacements.

As *C. burneti* may thus be carried in dust, an explanation is to hand for a number of outbreaks.

In February to May, 1948, 68 cases occurred in a college of agriculture in California (Clark, Bogucki *et alii*, 1951).

The weather was dry, the air dusty and the winds prevailing at the time blew across the campus from the barns that housed the livestock. The milk and excreta of some of the sheep were shown to be infective.

Robbins, Gauld and Warner (1946) investigated a number of outbreaks of "Q" fever among American troops in Italy in 1945, and found that there was usually an association with animal life, such as pigeons, rats, mice and cattle. An association with dust, either accumulated in attics or on hay or straw, was quite striking. In one outbreak affecting 269 soldiers, evidence pointed strongly to a barn as the source of infection. In the hay loft of this barn all the soldiers had attended motion pictures. The hay on which they sat was old, dusty and mite-infested, and came under suspicion, but in the light of the Los Angeles experience the source of infection might well have been the cattle which were stalled beneath rather than the hay.

Davoli and Signorini (1951) studied four outbreaks in Florence. Many of the patients lived close to streets along which goats or sheep habitually passed. Direct contact with animals and alimentary tract infection could be excluded in most, and the most likely explanation for the infection was the inhalation of dust contaminated with excreta of sheep or goats.

Infection by dust may explain also some individual cryptic cases. The wind may have carried infected dust to the victim at a distance, or he may unknowingly have passed near livestock quarters. In an agricultural area such experiences could readily occur.

#### Remote Transmission by Particulate Matter.

An outbreak of "Q" fever in 1948 in a factory in Philadelphia (Sigel *et alii*, 1950) may be accepted as an example of remote transmission. The factory processed wool and goat hair, and in the processing much dust was produced. It seemed likely that the infection was caused by inhalation of this dust and that the rickettsiae were brought to the factory in the wool or hair. There is no evidence of indigenous "Q" fever in Pennsylvania. Wool or hair certainly forms a link between the environment of the patients and sheep or goats somewhere. The place of origin of the wool or hair could not be determined, as consignments came to the factory from many countries in the world.

#### Obscure Transmission.

There are a number of outbreaks in the literature in which investigation failed to indicate the mode of transmission. Several interesting examples have been reported from Switzerland.

In April, 1947, 19 cases of fever occurred among the employees of a locksmith's workshop at Chur, and a retrospective diagnosis of "Q" fever was made nine months later by complement fixation tests (Wegmann, 1948). The 19 cases occurred among 75 persons who had unpacked and erected a heavy press which had arrived from Cincinnati, United States of America, packed in straw, paper and wood wool. The infection was ascribed to inhalation of infected dust from the straw.

As this was one of the earliest recognitions of "Q" fever to be made in Switzerland, it was natural to consider the possibility that the straw from America might be the source of infection. However, in the four years 1947 to 1951, 975 Swiss cases of "Q" fever have been established by serological or other tests carried out in the Bacteriological Institute at St. Gall (Burgdorfer *et alii*, 1951). This means that Switzerland is a highly endemic area, and it is therefore unnecessary to look across the seas for the source of the epidemic in Chur.

Rather similar outbreaks occurred a few months later in a mental hospital at Geneva (Mäkinen-Foré, 1950), and in the spring of the following year in a furniture factory at Bremgarten (Gutscher and Nufer, 1948) and in a school for recruits at Monte Ceneri (Vischer, 1949). In none of these was the mode of transmission demonstrated. The occurrence of most of these outbreaks in the spring suggests a seasonal influence, and one looks forward to the

elucidation by the Swiss workers of the factors in transmission that operate in their country.

An outbreak of "Q" fever in June, 1950, affecting 28 persons at a college of art in Canterbury, England, was carefully investigated (Harvey *et alii*, 1951). Although "Q" fever is endemic near Canterbury, the pathway by which infection reached the college could not be detected. No doubt with Wegmann's report in mind, some attention was directed to a packing case, which had been opened and its straw removed nineteen days before the outbreak.

An American bomb group, 1600 strong, operated from Grottaglie Air Base in south Italy for seventeen months. They camped beside the mile-long airstrip. There was no "Q" fever until they were on the point of embarking for home in May, 1945, when 400 men were infected. The illnesses became manifest *en route* or after their arrival in America (Commission on Acute Respiratory Diseases, 1946a). The infective agent must have been present for a brief period throughout the length of the camp. No explanation for the outbreak was arrived at, although there were several observations of possible significance. Sheep and goats were herded in nearby pastures; before the group left there was a general clean-up of the area; and on the last two nights the men slept in the open on the ground.

These obscure outbreaks are a challenge to the epidemiologist. Do they represent a particularly devious pathway from animal to man or are we dealing with some quite novel mechanism?

#### Discussion.

At present preventive measures against "Q" fever are available for only two fractional groups—pasteurization to prevent infection through milk, and vaccination for laboratory workers or others subject to intense exposure. As with brucellosis, prevention of human "Q" fever will depend essentially on the control of the disease in animals.

It is instructive to note the number of outbreaks described in the literature that were diagnosed only in retrospect. In many cases the apparent reason for the delay in diagnosis was that the patients did not have an occupational association with livestock. Animals have been stressed in this paper as a source of infection, but an emphasis on occupation may lead to the overlooking of many cases. We must be alert to recognize cases of "Q" fever without regard to occupational history.

It is not surprising that individual workers, after studying particular outbreaks, have reached quite different conclusions. In different countries and in different environments the circumstances that mediate infection to man may vary widely. The source may sometimes be cattle, sometimes sheep, sometimes goats. These animals vary in numbers, in the proportion that are infected, in methods of management, and in closeness of human association. The incidence of infectivity may be seasonal or perennial. Transmission may depend on the vagaries of wind, of rain and of sunshine.

We can only speculate on the possible roles of other mammalian, avian and arthropod sources.

There are so many queries still that one should be cautious in accepting conclusions. Information tomorrow may upset today's cherished opinions, and who can tell what surprises yet lie ahead?

#### Summary.

1. The importance of ticks as a reservoir of *C. burneti* is shown by the large number of species found naturally infected or capable of experimental transmission, their widespread geographical distribution, the profuse multiplication of rickettsiae within infected ticks and the failure to implicate any other group of arthropods. However, ticks have very little relation to human infection.

2. On the other hand, the reservoir of infection represented by cows, sheep and goats is very important as a source of human infection. Infectivity resides particularly in placenta and milk.



3. Human case-to-case infection is on record, but is rare.
4. The association of "Q" fever patients with the animals from which they were presumably infected shows all degrees of closeness. Some patients were occupationally in immediate contact with animals; some resided near by. Infection was occasionally carried on clothing and very often in dust. Sometimes the association with animals was remote but traceable. Sometimes no association at all could be discovered.
5. The high resistance of *C. burneti* to heat and desiccation allows contaminated material to retain its infectivity for long periods during which it may be transported to a distance.
6. Inhalation is the mode of entry of *C. burneti* into man in the great majority of cases. A small but definite group appears to be due to the ingestion of raw milk. Occasional examples of other portals of entry may be found by searching the world literature.
7. The still unsolved problems of "Q" fever—particularly that of prevention—present a challenge to the investigator.

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## WORLD DEVELOPMENTS IN CLINICAL PATHOLOGY.<sup>1</sup>

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UNDER the auspices of the Medical Research Foundation a survey was made of recent developments last year by an overseas tour which included the following centres and meetings: Chicago, Detroit; the 100th annual meeting of the American Medical Association, Atlantic City; New York; London; the 83rd meeting of the Pathological Society of Great Britain and Ireland, Liverpool; Manchester Royal Infirmary; Manchester Regional Centre of the National Transfusion Service of Britain; Conference on Industrial Medicine, London; annual meeting of the Diabetic Association; Pregnancy Diagnostic Centre at Watford; Post-Graduate Medical School, Hammersmith; First International Conference on Clinical Pathology, London; National Blood Transfusion Centre, Paris; International Blood Transfusion Congress, Lisbon; Rome. A previous tour undertaken in 1949 included San Francisco, Chicago, Detroit, New York, Washington, Pittsburg, Philadelphia, Boston, Toronto and Rochester (Minnesota).

The outstanding impression is that clinical pathology has developed more in the last ten years than any other branch of medicine. It is no longer the handmaid of medicine, it is a sister. Its growth has given it the capacity to contribute fundamentally to the practice of medicine. It cannot prove itself efficient, however, without the financial support that is adequate for its present-day needs, or without the thoughtful cooperation of those who command its services.

The demand for pathologists and qualified technicians has now far exceeded the supply. Hospitals, even general hospitals, are increasing their building accommodation up to 20% to provide laboratories.

<sup>1</sup> Read at a meeting of the Queensland Branch of the British Medical Association on April 4, 1952.

There are two distinct branches of pathology in America—clinical and morbid anatomy. Clinical pathology today plays an important part in the preliminary survey of the patient, in pre-operative investigation, in the study of the patient's progress, in the control of therapy and in evaluating prognosis. It plays an integral part in clinical research.

#### Autopsies.

In the United States of America the emphasis on the importance of the autopsy grows stronger each year. A high proportion of autopsies is essential for the accreditation of a hospital. Every possible region of the body is examined, even the sphenoidal sinuses approached through the base of the skull. It is quite common for the autopsy to take four hours to perform. Some thirty areas of the body may be selected for histological study, and a condensed single-spaced four-page report prepared. In such organizations as the Mayo Clinic and the Banting Institute, a fellow in pathology may take a week to prepare one case for a clinical-pathological conference.

#### Pathological Histology.

An automatic solution-changer is standard equipment in American, Canadian and British pathology laboratories. By this expensive but efficient instrument, the tissues are automatically transferred through the preserving, dehydrating and solvent solutions and into the paraffin bath during the night. The American and British instruments cost about £800 to land in Australia. A similar instrument which has given efficient service now for eighteen months was made in Brisbane by the Medical Research Foundation's mechanic at a cost of £150. This is possibly the first instrument of its kind to be made in Australia. Histological studies of tissues removed at operation, and diagnostic biopsies of lymph glands, *cervix uteri*, endometrium, stomach, bone marrow, liver, spleen, testis and autopsy specimens are much more widely made in American, Canadian and British practice than they are in Australia.

The storing of the prepared sections for reference and further study presents quite a problem. Storage in flat shallow trays occupies too much space. The simplest method is to use two labels of thin cardboard on each end of the microscope slide. The slides are then stored on edge in serial numbers in metal drawers. Another method is to make use of a folded card which fits a standard metal filing drawer. The lower end of the card is turned back and held with staples in such a way that the ends of three slides fit into a pocket covering the lower third of the slide.

Frozen sections are extensively employed in some American hospitals, notably those of the Mayo Clinic. The histology laboratory is situated closely adjacent to the operating theatres.

#### Laboratory Technicians.

Britain and America have developed numerous training courses for laboratory technicians. The senior technician in a large American laboratory is usually a doctor of philosophy, and many are science graduates. For the middle grades of technicians a combination of laboratory experience and theoretical training produces good results. The American Society of Clinical Pathologists established a registry of medical technologists in 1928 and standardized their training. These standards have been progressively raised since then. The code of ethics to which registrants must subscribe includes an undertaking that they will work only under the direction of a pathologist, and that they will not operate an independent laboratory.

#### Organization of Rural Pathology Services.

In Britain the principle has been the establishment of central or regional laboratories, with smaller laboratories in the surrounding country districts. These smaller laboratories deal with the routine work of the hospital, examinations which require special equipment and experience being referred to the regional laboratory. Throughout the chain of laboratories the work is under the personal direction of

a pathologist. Unfortunately these pathology services are not readily available to the general practitioner.

In America the emphasis is strongly against nationalized practice, and hospitals or districts which have not sufficient population to support a full-time pathologist establish a laboratory staffed by one or more technicians supervised by a pathologist from a nearby larger town. He visits the laboratory, and is able to direct the work by supplying standard solutions, media and other requirements, and by supervising the techniques used.

The principle in both Britain and America is that laboratory medicine requires to be practised under the direction of a pathologist. With increasing demand in Australia for clinical pathology services, practitioners in many country towns are feeling the need of a local laboratory. At the present state of the demand in Australia, experience has shown that a population of 40,000 within a radius of 40 miles of a centre is necessary to warrant the establishment of a clinical pathology laboratory employing one senior technician working under the direction of a pathologist. In smaller centres, the situation can be met by the visit once a week of a pathologist or senior technician, for the collection of specimens which will be examined at a central laboratory.

In Australia, there is an overdue need for a policy of the Federal Council of the British Medical Association on the development of clinical pathology services especially in the country areas. In the absence of such a policy, Federal and State Governments, universities, public hospitals, pathologists in private practice and independent technicians provide a service which varies in emphasis from one State to another, but which has no orderly plan of development. The capital cost of establishing a modern pathology laboratory is such that, in the absence of a policy, it will be difficult in the future for a private pathologist to establish a laboratory and to bear the increasing costs of salaries and maintenance. The result will be that the pathology service will be nationalized, and the capital and maintenance costs will be met from taxation. Experience in other countries indicates the value of freedom in all branches of medical practice. If pathology is nationalized, what will be the next branch of medicine to come under government control?

America has shown that a pathology service can be conducted on a high standard on the same basis of scientific freedom as all other branches of medical practice.

#### Hæmatology.

In his presidential address to the International Congress of Clinical Pathology, Sir Lionel Whitby condemned the expression of hæmoglobin in percentages, as being easily remembered but meaningless and misleading. A percentage can be valid only if the normal is constant. With a normal variation for the adult of 14 to 17 grammes per 100 millilitres, adult females 12 to 15.5 grammes per 100 millilitres, and a bewildering range in infancy and childhood, how can a percentage value provide any real information? The colour index is also misleading because it can be affected by the cell volume and the concentration of hæmoglobin. The necessary absolute measurements are the mean corpuscular volume and the mean corpuscular hæmoglobin concentration, but these require a venous specimen for the hæmatocrit determination.

Dacie, the hæmatologist at the British Post-Graduate Hospital at Hammersmith, uses a 0.02 cubic centimetre hæmoglobin pipette for red cell counts. He dilutes that quantity in four cubic centimetres of a solution containing formalin (1%) and sodium citrate (3%). He mixes this suspension on an ingenious turntable which is tilted at an angle of 45°.

#### Bacteriology and Mycology.

The introduction of antibiotic therapy has changed the primary function of the infectious disease laboratory. It is now the in-vitro study of the causal organism's sensitivity to antibiotics and sulphonamide drugs. Speed and simplicity are essential. There are three methods: (1) the use



of a filter paper disk impregnated with the drug; (ii) agar diffusion; (iii) tube dilution. This study is specially valuable in subacute bacterial endocarditis, staphylococcal sepsis and urinary tract infections. An increasing number of coagulase-positive strains of staphylococcus that are highly resistant to penicillin and to streptomycin are being isolated in America.

Phage typing of staphylococci has been of value in tracing carriers amongst hospital personnel, and in identifying the penicillinase-producing mutants that are frequently responsible for cross-infection in hospitals. This is valuable also in the study of sources of epidemics of food poisoning and *penicillium neonatorum*.

Cold agglutination tests with human group O cells are useful in the classification of atypical pneumonia. The M.G. strain of hemolytic streptococcus is also agglutinated. In the United States of America physicians are deeply concerned with the increased incidence of mycotic infections of the lungs. Most systemic mycoses are of pulmonary origin.

### Biochemistry.

The clinical biochemist today no longer uses his eyes looking down a colorimeter. He uses a photo-electric eye which does not tire as does the human eye. The photo-electric colorimeter has revolutionized biochemistry, but even this instrument has had its day. The necessity to change glass filters to vary the colour of the light passing through the test solution has resulted in the development of the spectrophotometer. Here a turn of the knob gives any colour of the spectrum to the light beam. In certain biochemical estimations, especially that of serum potassium and sodium, the flame photometer is the modern instrument. In prolonged intravenous administration of fluids containing protein hydrolysate, sodium chloride, dextrose and potassium chloride, the control of the potassium balance is essential. Prolonged duodenal or gastric drainage after operative procedures provides the conditions for the development of alkalosis with potassium deficiency. The post-operative care of surgical patients has entered a new chapter with the aid of such biochemical controls.

Paper chromatography is an improvement on other methods for the qualitative and semi-quantitative analysis of body fluids for amino acids and sugars. For the identification of reducing substances in the urine, it has replaced the osazone and yeast methods.

Enzyme chemistry is now a discipline in its own right. The new emphasis is on the study of the dynamic equilibrium of multiple enzyme systems rather than on single enzymes.

Group exchange resins offer quite exciting prospects in the laboratory and in therapeutics. By taking these resins by mouth in cases of nephrotic oedema, one grain of resin exchanged 1.25 milliequivalents of sodium and potassium *in vivo*. The control of the sodium-potassium balance in the serum is essential in this form of therapy. There occurred a reduction of oedema and loss of weight.

### Coagulation and Fluidity of Blood.

Most laboratories of clinical pathology have a special department for the control of anticoagulant therapy. Heparin and dicoumarol still hold pride of place. By the use of an electric time-meter giving readings in seconds and tenths of seconds, a more accurate reading of the prothrombin time can be made. Without laboratory control, treatment with the long-acting anticoagulant agents such as dicoumarol is highly dangerous.

No conference on clinical pathology would be complete without the announcement of a new coagulation factor, and this was no exception. Owren from Oslo has named his factors five and six, pro accelerin and accelerin respectively. These govern the velocity of thrombin formation. The new factor is proconvertin, which is one of the complex of factors necessary for the conversion of prothrombin to thrombin.

Rosemary Biggs, working with Macfarlane of Oxford, rather stunned the congress by ascribing a hæmorrhagic

diathesis in a woman to the presence of an anti-anti-hæmophilic globulin.

The condition of heparinæmia is receiving increasing attention, and the heparin-neutralizing agents, toluidine blue and protamine sulphate, are being found of clinical value in some hæmorrhagic states.

### Blood Grouping.

There is now a well-recognized need for the routine blood grouping of patients at risk, such as pre-confinement patients and all patients before major operations. Hæmorrhage now ranks first as a cause of obstetric mortality.

The Coombs test is now completely established as indicating sensitization. The capillary tube (Chown) method of testing for the Rhesus factor is in widespread use, but the technique must be strictly followed. This method results in immense saving of testing serum. Enzymes such as trypsin and papaine have a "surface-smoothing" action on the red cell and reveal antigens which would not otherwise be demonstrable. The red cell is now considered to be like a golf ball in having hills and valleys on its surface. The "Rh" nomenclature is giving way to the CDE description of the Rhesus factors. The blood groups (nine systems) are the ideal tools for the study of racial relationships.

### Plasma Volume Expanders.

Materials having a molecular weight of about 70,000 are not readily excreted by the kidney and do not increase the accumulation of tissue fluids which have escaped through an injured vascular system. This is the basis of the present trend towards the intravenous administration of macro-molecular fluids in the treatment of shock, in the first-aid treatment of serious hæmorrhage, and in the treatment of burns.

The ideal fluid should be non-toxic and should not embarrass the reticulo-endothelial system, the liver, the kidney, or the lung. It should be non-pyrogenic and non-allergenic and be able to be autoclaved without losing its nature. It should be mostly eliminated within a week and be capable of being administered rapidly without undesirable effects. It should cause a sustained increase in the cardiac output and increase the venous pressure.

Acacia (6%) was used in World War I, but it tends to damage the liver. Acacia and algin (from seaweed) are potentially allergenic.

Bovine serum albumin (globulins removed and agglutinins destroyed by controlled heating) has been used on the Continent without many adverse effects. The albumin is a limited source of amino acids. There is a danger of transmission of undulant fever and tuberculosis. It is difficult to ensure freedom from protein reactions. It can be sterilized only at low temperature.

Gelatin has the disadvantage of being a gel at ordinary temperatures, but it assists in maintaining a nitrogen balance. The fate of pectin and P.V.P. (polyvinyl pyrrolidone) in the body is not known and this constitutes the chief bar to their adoption. P.V.P. is a synthetic polymer made from acetylene.

Dextran can be boiled, autoclaved to 120° C. or frozen to -7° C. without effect on its composition. With infusions up to two litres of 6% solution within twenty-four hours there is no evidence of histological change in the reticulo-endothelial system.

Two litres of 6% dextran solution represent (for an 80-kilogram human) 1.5 grammes per kilogram of body weight. Hartmann gave 1.8 grammes per kilogram to animals every three days for seven injections (total 12.6 grammes per kilogram) and found histological evidence of vacuolar degeneration of the interstitial tissue, infiltration of the blood vessel walls in the lung, and foam cells in the liver and kidney. These changes were reversible.

Pulaski found Swedish dextran allergenic to heavily immunized veterans with some swelling of the face and some anaphylactic phenomena, but this did not occur with the American product which is more highly purified.

Maycock, adviser to the Lister Institute in England, has been responsible for the improvement of British dextran. He gave 9.2 grammes per kilogram of body weight to rabbits and found it present in the skin, brain and bone marrow after sixteen weeks. By acetone fractionation, the large molecules are removed from the dextran.

Valuable and frequently dramatic clinical results in shock and hæmorrhage are obtained with one litre of 3% dextran in saline. This is in the region of 0.37 gramme per kilogram of body weight. One-third of the dextran is excreted by the kidneys in twenty-four hours, one-third passes into the tissues and is slowly excreted, and one-third is thought to be metabolized.

The Mayo Clinic (Lundy, Gray and McCraig) have used dextran on 2000 patients since 1946 and have found it of "tremendous value" as an immediate treatment for shock and serious hæmorrhage. They have seen "no harm come from its use". In some instances dextran has appeared to be life-saving. It has been used largely as a preventive of shock in sympathectomies for hypertension. I have now used 60 litres of 3% dextran solution and have found no untoward effects, and it has done all that was claimed for it by the speakers at the symposium at the American Medical Association meeting in 1951.

T. P. Bull of Birmingham reported to the International Blood Transfusion Congress in Lisbon the successful use of dextran in the parenteral treatment of burns. The general formula was the use of a litre of dextran solution for every 10% of the burned area. Half the amount is given in the first eight hours and the remainder in the ensuing eighteen. There was no evidence of immediate or late toxicity, and no signs of anaphylaxis were observed. He found no difference in the mortality experience as between dextran and plasma. Workers in the United States of America are keenly interested in the plasma volume expanders for the following reasons: (a) The use of plasma or serum increases the incidence of homologous serum hepatitis. The virus has survived irradiation, and nitrogen mustard has proved ineffective. (b) The demand in America for whole blood for civilians (3,000,000 pints) and defence (4,000,000 pints) has exhausted the supply of donors. The donor target was 2,000,000 pints short last year. The American view is that the demand for whole blood has exhausted the supply of donors, and there is no balance available for serum production.

#### Transfusion Reactions.

About 4% of all transfusions is the present minimum of reactions. Compare this with about 90% in the days before 1935, when pyrogens were not known, and only the ABO system was used in cross-matching.

An analysis of these reactions shows the distribution to be as follows: pyrogenic 3.1%; allergic 0.5%; hæmolytic 0.2%; reactions due to circulatory overload 0.1%; pulmonary thrombosis 0.1%. Hæmolytic reactions are diminishing with new methods of cross-matching, albumen and trypsin being used to reveal "hidden" antigens. There is some interesting work being done in America in which an anti-histamine is used with the blood to abolish both allergic and pyrogenic reactions.

#### The Organization of Blood Banking.

In most countries in peace time, one blood transfusion is required each year for every 120 members of the population. Throughout the world there are several methods by which donors are recruited, examined and bled and the product is grouped, tested, stored and distributed. These methods fall into three broad groups.

1. The national service completely financed by taxation. This provides a high standard of technical efficiency, but a highly complex organization is required, and requires to be maintained at a high cost. Information on costs of production was difficult to obtain; but by comparison with organizations of similar complexity in other countries it is assessed at £2.10s. per pint. Donor recruitment is difficult even in those countries which have a "welfare State"

consciousness. In Britain the steep rise in the total cost of a nationalized medical service reflects the general trend.

2. Red Cross service. In half the countries of the world (United States of America, Italy, the Philippines, Greece, Portugal, Peru, Belgium, Holland, Canada and Australia) the Red Cross has assumed responsibility for part or whole of the blood-banking activities. In those countries from which information was available, the service could not be provided from the Red Cross Society's financial resources, and large government subsidies were required involving a danger of political control. Such finance as is provided from the society's funds is subject to a high collection cost, and a complex general administration is necessary.

In the American Red Cross, specially trained nurses bleed the donors. The service is efficient, but complex. The unit cost in 1951 was almost constant at £2.5s. per pint. Actually, the term "blood transfusion service" applied to what is really a blood-banking service is a misnomer except in Australia, where in some States the patronage of the private practice of part-time medical officers employed by the Red Cross destroys the essential independence of the organization. The centralization of the blood banks separates the donor and the recipient, and it is difficult to make contact with the relatives and friends of the donor. In spite of costly donor recruitment campaigns, only about one in ten of the potential donors in a community can be induced to give their blood.

3. The blood bank as an integral part of a pathology service. In America, this is the predominant method of blood-banking. A survey by the Bureau of Medical Economics of the American Medical Association in 1950-1951 showed that there were in the United States 1500 hospital blood banks, 62 non-hospital blood banks and 34 Red Cross centres. The Association officially encouraged this method by the publication of a booklet "How to Start and Operate a Blood Bank". These small local blood banks are part of the organization to collect blood on a national scale for forwarding to Korea. They have a capacity for a large immediate increase in their collections in the event of emergency. Their wide dispersal reduces their vulnerability in the event of an attack by atomic weapons.

In peace-time activities, the unit cost is kept low by sharing the cost of buildings, equipment, personnel and basic materials with the other activities of a pathology service. In a community of 40,000 there would be about one blood transfusion per day, and this would not justify the services of a technician whose activities are restricted to the technical side of blood taking. But this is an economic community for a pathology service employing one technician supervised by a pathologist. The technician would also cover the blood-banking techniques. One advantage of the small local blood bank is that the relations and friends of the recipient can provide the donors on a replacement basis. This avoids the cost of a donor recruitment campaign.

In the blood-banking service of the Medical Research Foundation in 1951, 1200 donors were bled in Brisbane without any public campaign for their recruitment. They were obtained by a personal approach from the relatives and friends of those who received the blood. By sharing the blood-banking costs with those of a pathology service, the unit cost was 9s. per pint. This is one-fifth of the cost involved in the first two methods of blood banking.

The Newcastle General Hospital in New South Wales has demonstrated the economy and efficiency of this method of blood banking. Blood banking is now finding its place as a normal activity of medical practice. Laboratory technicians are generally well versed in routine blood-banking practice.

There is a need for a central blood-group reference laboratory for the study of unusual phenomena and to act as a distributing centre for testing serum. In Australia this function is ably performed by the Commonwealth Serum Laboratories.

There is a need also for an agency to survey and coordinate the activities of the blood banks. In America, this is done by the Committee on Blood Banks of the

American Medical Association. From the technical aspect, blood grouping and transfusion are a branch of hæmatology.

#### The Titration of Gonadotrophic Hormone.

Chorionic gonadotrophic hormone is produced by the Langhans cells of the chorion. When the ovum dies, the Langhans cells die also, and production ceases. If there is hæmorrhage into the intervillous space, the absorption of hormone is interfered with and diminished quantities appear in the urine. A low titre of hormone therefore sometimes occurs in threatened abortion and extrauterine pregnancy.

Chorionic gonadotrophic hormone starts to be produced as soon as implantation occurs and is in significant quantities about the end of the second week after conception. The hormone production rises to a peak at sixty to eighty days and then falls rapidly; it is at a low level in the second and third trimesters.

A variety of animals is used throughout the world for "pregnancy diagnosis". Expressed in the number of international units per millilitre of urine injected that are required to bring about a positive result, the sensitivity can be graded as follows: *Xenopus*, female (with the use of seven millilitres of concentrated urine), 0.8; rabbit, female (Friedman), one; *Rana esculenta*, male, two; *Bufo arenarum*, male, four; mouse, female (Aschheim-Zondek), five; *Bufo bufo*, male, eight; and *Bufo marinus*, male, 10.

The Pregnancy Diagnostic Laboratory at Watford (near London) uses the *Xenopus* female and claims to achieve no false positive results and 99.6% accuracy. All specimens are concentrated by the absorption of the hormone on to kaolin. Landgrebe, at the Pregnancy Diagnostic Laboratory at Edinburgh, now uses the female *Xenopus*. He carried out a series of 12,567 Aschheim-Zondek tests and 5666 hormone tests using the female *Xenopus*. He found that the *Xenopus* produced more reliable results at half the cost.

Six species of toads are used in different parts of the world for spermiation tests. Speakers at the International Congress on Clinical Pathology considered that spermiation tests were unreliable. The animal has to be kept within narrow limits of temperature, it is subject to seasonal variations, and it will give a false positive result with adrenaline. It will be seen that, unconcentrated urine being used, the rabbit (Friedman test) is the most sensitive animal. The disadvantage with these animals is the cost of maintaining them in separate cages.

The *Bufo marinus* (canefields toad of Queensland) has been used extensively in Australia, but few statistical reports are available. By personal contact with the clinician I checked the last hundred hormone tests I have made and found 8.1% false negative results with the use of the male *Bufo*. All the tests which give a negative result on the male toad had been repeated on the rabbit at the same time, and all except one gave positive results on the rabbit. The duration of pregnancy in the one exception was between two and three weeks. By the use of the rabbit on those specimens which give negative results by the toad, pregnancy can be diagnosed at three or four weeks, whereas the result with the toad does not usually become positive before the sixth week of pregnancy. It is the early information, before a clinical diagnosis can be made, which is of the most value to the clinician.

O'Reilly, of the Queensland State Health Department, reported his results with the *Bufo marinus* to a meeting of the Queensland Branch of the Australian Association of Pathologists. In his first series he had 11.9% of false negative results. When concentrated urine was used in a series of 90, the false negative results were reduced to 6.6%, but 2.2% of false positive results appeared. These false positive results are an unfortunate development, because a valuable attribute of the *Bufo*, with the use of unconcentrated urine, had been its freedom from false positive results. Hawker, at the physiology school of the University of Queensland, found the *Bufo marinus* unreliable and misleading as a test animal for gonadotrophic hormone. All workers with the *Bufo marinus* agree that

the animal is not suitable for dilution tests in the diagnosis of hydatidiform mole and chorionepithelioma. I have found this to be so, and I use the rabbit for this purpose. The Pregnancy Diagnostic Laboratories in England and Scotland use the female *Xenopus* exclusively. In England these toads are bred in the laboratory from known responsive strains.

I visited Schwabacher at the Pregnancy Diagnostic Laboratory at Watford, and she kindly gave me a supply of *Xenopus* toads. In Australia, as the animals were for scientific purposes, the senior representatives of the Director of Quarantine in Northern Territory and New South Wales gave permission to bring them into Queensland. In this way the regulation governing the importation of animals (Proclamation 41A, published in the *Commonwealth of Australia Gazette*, Number 153, of August 21, 1947) was complied with. In spite of this, I was served with official orders to seize and destroy the animals.

#### RUPTURE OF THE UTERUS: A REVIEW OF TWENTY-FOUR CASES AT THE ROYAL HOSPITAL FOR WOMEN, PADDINGTON, DURING THE LAST TWENTY YEARS.

By T. H. SMALL,  
Sydney.

##### Incidence.

In the period from 1930 to 1950, 51,798 women were delivered in the public beds of the Royal Hospital for Women, Paddington, and of them, 24, or 0.046%, are recorded as having sustained rupture of the uterus. Ten were "booked" patients and 14 were "emergency admissions".

The incidence for each year is shown in Figure I.

##### Age.

Two of the patients with rupture of the uterus were aged 21 years, one 25 years, three 27 years, one 28 years, two 29 years, two 30 years, two 32 years, one 33 years, one 34 years, three 36 years, one 38 years, three 40 years and two 42 years.

##### Parity.

##### Miscarriages.

Six only of the 24 patients had had previous miscarriages, four had had one, one had had five, and another had had eight. Of the four with one miscarriage, one had had a previous classical Cæsarean section, two had had lower segment operations, and the fourth suffered rupture of her uterus in her eighth full-time confinement. The patient with the history of five miscarriages had had a classical Cæsarean section and the uterus ruptured in the third full-time confinement, artificial rupture of the membranes for supposed concealed accidental hæmorrhage having been performed.

##### Pregnancies.

Of those patients who had advanced to seven months' pregnancy or more, three were pregnant for the first time, three for the second time, eight for the third time, two for the fourth time, one for the sixth time, one for the seventh time, two for the ninth time, and one for the thirteenth time; the remaining patient was three months pregnant at the time of rupture, which followed on two previous classical Cæsarean sections, the second being because of ruptured scar of the first.

##### Previous Uterine Operations.

Ten women had had operations on the uterus. One patient had sustained a previous perforation during curettage of her puerperal uterus, six had had one classical Cæsarean section, one had had two classical Cæsarean sections, and two women had had a lower segment opera-



tion; none had a history of myomectomy, hydatidiform mole or manual removal of the placenta.

#### Induction of Labour.

Two patients had been given quinine, castor oil and then pituitrin, three minims every half-hour for five doses; another had had a precipitate labour following stripping of the membranes; a fourth, with a history of previous Caesarean section, had undergone induction of labour by artificial rupture of the membranes on the erroneous diagnosis of concealed accidental hæmorrhage.

#### Symptoms.

As recorded by a constantly changing staff, the symptoms were very varied and are not of great statistical value, many signs and symptoms no doubt not having been noted. However, in recent years fuller histories have been taken.

In four cases no symptoms at all were recorded, but merely the diagnosis, as referring practitioners did not send in a history with the patients, who were too ill to give a proper one.

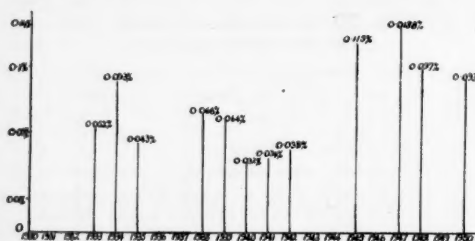


FIGURE 1.

Twenty years' incidence of rupture of the uterus. Number of births, 51,798; number of cases of rupture of the uterus, 24 (0.046%). "Booked" cases, 10; "emergency" admissions, 14. The number of ruptured Caesarean scars was one in 1934, three in 1945, four in 1947 and one in 1948. There was no medical report in the year 1937.

The classical symptoms of severe tearing pain followed by cessation of contractions and pains were not recorded in any case.

Severe backache or pain in the lower part of the back occurred in two cases; severe precordial pain was mentioned in a note accompanying another patient admitted to hospital unconscious, with pin-point pupils, imperceptible pulse and absence of reflexes following on administration of morphine and a 30-miles journey to hospital. She was thought to have had coronary occlusion.

Two patients complained of severe epigastric pain, and two others had severe shoulder pain due no doubt to sub-diaphragmatic blood, as in cases of ruptured ectopic gestation.

Five patients had nausea and/or vomiting, and 10 complained of severe abdominal pain unlike labour pains.

#### Signs.

Examination revealed the presence of Bandl's ring in one case prior to rupture, and in another case the patient was admitted to hospital in coma and moribund after rupture. Gas crepitus was detected over the hypogastrium in one case; the patient was five days in labour, had *Bacillus welchii* infection, and had sustained rupture of the lower segment of the uterus before admission to hospital. A hernia of the membranes through a ruptured uterine incision was detected in two cases. Pronounced cyanosis was a feature in two cases. Retained placenta occurred in two cases, and dullness in the flank was noted in two cases.

A mass was palpable in the abdomen in four cases, being the uterus contracted down after escape of the fetus, or most of it, into the abdominal cavity. Irregular

uterine action as well as inability to palpate foetal outlines was noted in five cases. Very rapid respiration occurred in five cases. The fetus was palpable with abnormal ease in six cases. Six patients had air hunger and/or restlessness. The abdomen was recorded as being abnormally distended in six cases, and tympanites was noted in six cases. Abnormal pallor and excessive cold perspiration occurred in seven cases. The foetal heart sounds were absent on or soon after the patient's admission to hospital in nine cases.

Extreme abdominal and particularly uterine tenderness occurred in ten cases. Admission of the patient to hospital in a state of shock with a pulse rate of 120 per minute or more, or collapse soon after admission, was recorded in 13 cases.

Excessive hæmorrhage *per vaginam* for the particular stage of labour occurred in 14 cases.

These symptoms and signs are grouped in Table I.

TABLE I.  
Relative Frequency of Symptoms and Signs.

Number of Cases.	Symptoms Recorded.	Signs Recorded.
4	Nil.	
1	Backache, precordial pain.	Coma, gas crepitus, Bandl's ring, tympanites.
2	Shoulder pain, epigastric pain.	Cyanosis, dullness in flank, uterine hernia, retained placenta.
4	—	Abdominal mass felt.
5	Nausea, vomiting.	Irregular uterine action, very rapid respiration, fetus not palpable normally.
6	—	Air hunger, restlessness, abdominal distension, fetus too easily palpable.
7	—	Abnormal pallor, cold clammy perspiration.
9	—	Absent foetal heart sounds.
10	Severe abdominal pain, not like labour pains.	Extreme abdominal or uterine tenderness.
13	Sudden collapse after admission.	Shock on admission to hospital, pulse rate over 120 per minute.
14	—	Excessive vaginal blood loss.

#### Presenting Part.

The breech presented in three cases, the shoulder in three, and the head in eleven; in one case the presentation was compound, in another the pregnancy had advanced to three months only. Five case histories contained no record about the presenting part.

In five cases the presenting part was engaged and in 12 it was not engaged; in seven cases the position was not stated.

#### State of Cervix.

The *cervix uteri* was closed at the time of rupture in four cases, up to one-quarter dilated in six, between one-quarter and one-half dilated in two, three-quarters dilated in one, and fully dilated in another. No note was made about the dilatation in ten cases.

#### Size of the Child.

One child was non-viable, one weighed between four and five pounds, two between five and six pounds, four between six and seven pounds, two between seven and eight pounds, three between eight and nine pounds, two between nine and ten pounds, one between ten and eleven pounds, and another over eleven pounds. No record was made in seven cases.

TABLE II.  
Site and Type of Rupture.

Complete.	Partial.	Site.				
		Upper Segment Only.	Lower Segment Only.	Both Upper and Lower Segments.	Lower Segment and Cervix.	Cervix Only.
20 cases (13 maternal and 16 fetal deaths).	4 cases (no maternal and 2 fetal deaths.)	10 cases: 1 perforation with curette, 1 from multiparity, 1 spontaneous rupture (fourth pregnancy), 1 spontaneous rupture (sixth pregnancy), 6 previous classical Caesarean sections.	7 cases: 2 lower segment Caesarean scars, 1 gas gangrene of lower segment (hydrocephalus), 2 placenta praevia, 2 forceps deliveries (delayed labour).	4 cases: 2 quinine and pituitrin inductions of labour, 1 case of multiparity (eighth pregnancy), 1 internal version (placenta praevia).	3 cases: 1 precipitate labour (retained placenta), 1 internal version (placenta praevia), 1 combined version (placenta praevia).	Nil.

## Site of Rupture.

The upper segment alone was involved in ten cases, the lower segment alone in seven cases, the cervix alone in no case. The rupture involved two portions of the uterus in seven cases (cervix and lower segment in three, both lower and upper segments in four) (*vide* Table II).

## Type of Rupture.

There were 20 cases of complete rupture, with 13 maternal deaths and 16 fetal deaths; and four cases of incomplete rupture with no maternal deaths and two fetal deaths, one being after three months' gestation.

## Probable Cause of Rupture.

The rupture was spontaneous in 14 cases; in two it resulted from obstructed labour (one case of hydrocephalus and one of disproportion), in nine from uterine scars (six upper segment, two lower segment and one perforation), two from multiparous weakness, and one from vascular disease of the lower segment associated with placenta praevia.

The rupture was associated with interference in 10 cases. One was a case of placenta praevia in which scalp traction had been applied; two followed medical induction of labour with castor oil, quinine and pituitrin; one occurred in asso-

TABLE III.  
Variety and Probable Cause of Rupture.

Variety.	Probable Cause of Rupture.	Number of Cases.	"Booked" or "Emergency".	Number of Previous Caesarean Sections.	Number of Previous Miscarriages.	Comment.
Spontaneous rupture (14 cases).	Obstructed labour: Hydrocephalus .. ..	1	E	0	0	Gas infection. Five days' labour before admission. Caesarean section. Died of uremia second week.
	Disproportion .. ..	1	B	8	0	
	Uterine walls damaged: Upper segment Caesarean section.	6	3B	$\begin{cases} 2 \\ 2 \\ 12 \\ 3 \\ 2 \\ 0 \end{cases}$	$\begin{cases} 1 \\ 8 \\ 0 \\ 0 \\ 0 \\ 0 \end{cases}$	5 had had one previous classical operation.
	Lower segment Caesarean section.	2	2B	$\begin{cases} 1 \\ 1 \\ 6 \end{cases}$	$\begin{cases} 0 \\ 1 \\ 1 \end{cases}$	1 had had two previous classical operations. Each had had 1 previous lower segment operation.
	Perforation of uterus ..	1	E	3	0	Curettage in previous puerperium.
	Uterine walls diseased: Microscopic diagnosis ..	1	E	0	0	Primigravida with placenta praevia and vascular disease of uterine wall.
	Multiparity .. ..	2	2E	$\begin{cases} 7 \\ 5 \end{cases}$	$\begin{cases} 1 \\ 0 \end{cases}$	Eighth full-time labour—sent in with diagnosis of "coronary occlusion". Sixth full-time labour—sent in with diagnosis of "accidental haemorrhage".
Rupture associated with interference (10 cases).	Medical induction: Quinine, oil, pituitrin ..	2	1B	3	0	Band's ring, sudden collapse, "accidental haemorrhage".
			1E	7	0	Eighth full-time labour, 3 sets of twins, urine "solid" albumin, systolic blood pressure, 220 millimetres of mercury.
	Surgical induction: Stripping of membranes ..	1	B	2	0	Precipitate labour; retained placenta 2 hours.
	Artificial rupture of membranes.	1	E	2	5	1 previous classical Caesarean section, possible "accidental haemorrhage".
	Rotation and application of forceps.	2	1B	0	0	Delayed second stage (24 hours before admission to hospital).
			1E	8	0	Ninth full-time labour (eclampsia, dead fetus).
	Scalp traction .. ..	1	E	0	0	Placenta praevia.
	Version: Internal 1 .. ..	3	1E	1	0	Placenta praevia.
	Internal 1 .. ..		1B	2	0	Placenta praevia.
	Bipolar 1 .. ..		1E	2	0	Placenta praevia.

TABLE IV.

Diagnosis.	Delivered or Undelivered.	Treatment.		Result. <sup>1</sup>			
		Procedure.	Number of Cases.	Mother Lived.	Mother Died.	Child Lived.	Child Died.
Correct diagnosis made before delivery or death and autopsy (16 cases).	Delivered (15 cases).	Abdominal delivery followed by:					
		Repair and sterilization .. ..	3	3	—	2	1
		Repair alone .. ..	2	1	1	1	1
		Subtotal hysterectomy .. ..	8	5	3	3	5
		Total hysterectomy .. ..	2	2	—	—	2
Diagnosis made by post-mortem examination (8 cases).	Undelivered (1 case).	Undelivered after artificial rupture of membranes as for accidental haemorrhage .. ..	1	—	1	—	1
	Delivered (3 cases).	Rotation and forceps .. ..	2	—	2	—	2
		Bipolar version for <i>placenta prævia</i> ..	1	—	1	—	1
		Internal version for <i>placenta prævia</i> ..	2	—	2	—	2
		Scalp traction for <i>placenta prævia</i> ..	1	—	1	—	1
	Undelivered (5 cases).	As for accidental haemorrhage .. ..	1	—	1	—	1
		As for coronary occlusion .. ..	1	—	1	—	1

<sup>1</sup> Six mothers died undelivered, seven died after delivery.

ciation with precipitate labour after stripping of the membranes; one followed artificial rupture of the membranes in a case diagnosed as concealed accidental haemorrhage with a history of a previous Caesarean section, the case being really one of rupture of this scar and not one of accidental haemorrhage. The sixth and seventh cases were associated with manual rotation and forceps delivery in obstructed labour, while three others occurred after internal version for *placenta prævia*, a practice abandoned some years ago in this hospital (*vide* Table III).

#### Associated Conditions.

Six patients had *placenta prævia*. Eight had preeclampsia (one of them also had severe revealed and concealed accidental haemorrhage). One had eclampsia with "solid" albumin on boiling the urine, gross oedema and a dead foetus, the result of having no antenatal supervision whatsoever. She was admitted to hospital after twenty-four hours in her ninth labour and was delivered by manual rotation of the foetal head and a difficult forceps extraction; the placenta was retained for two and three-quarter hours, and she then developed signs of ruptured uterus and acute pulmonary oedema with a fatal result.

#### Diagnosis.

Sixteen cases were correctly diagnosed, 15 patients being delivered and one not delivered. Eleven of the mothers were saved, four died after delivery, and one died undelivered. Of the infants, six survived and ten were lost.

Eight cases were not correctly diagnosed, which resulted in the loss of eight mothers and eight babies. Thus early and correct diagnosis is vitally important (*vide* Table IV).

#### Operative Treatment.

Abdominal removal of the foetus and placenta followed by repair of the rupture was carried out in five cases, one with sterilization and four without. In one case of this last group rupture occurred again early in the next pregnancy in the same year.

Subtotal hysterectomy was performed in eight cases and total hysterectomy in two, after removal of the foetus and placenta.

Manual rotation of the foetal head with forceps extraction was the mode of delivery in two cases.

Version ("internal" in two cases, "combined" in one) was performed in three cases of transverse lie of the foetus with *placenta prævia*.

#### Results.

Of the 24 mothers, 11 were delivered and saved, and 13 were lost, seven dying after delivery and six dying undelivered. Of the 24 possible children, six survived, 17 died, and one was not viable.

#### Comment.

An analysis is attempted of the clinical features recorded in 24 cases of ruptured uterus. The association of *placenta prævia* in six, toxæmia of pregnancy in eight, previous Caesarean section in eight, and perforation of the uterus in one case is noted. There is a suggestion that toxæmic oedema can affect the uterus, predisposing it to rupture, just as it does to inefficient action.

Multiparity (with more than five full-time pregnancies) was a feature in seven cases.

A variety of symptoms and signs is presented, suggesting that rupture of the uterus is not often a sudden and dramatic event (possibly it is masked by sedatives, analgesics and anaesthetics) and that the best way to diagnose it is to be always on the alert for it and to pass a hand into the uterus if in doubt. This is an extremely simple way, incidentally, to decide if another delivery *per vias naturales* is safe after a Caesarean section, and especially after a lower segment operation.

#### TREATMENT OF GONORRHOEA WITH TWO GRAMMES OF TERRAMYCIN IN DIVIDED DOSAGE OVER TWENTY-FOUR HOURS.

By R. R. WILLCOX, M.D.,  
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This is the third of a series of reports on the treatment of acute gonorrhoea with two grammes of terramycin. The first (Willcox, 1951a) referred to the results obtained by a single mass dose of two grammes, and the same amount in two doses each of one gramme given six hours apart; the second referred to two grammes given in eight six-hourly doses over forty-eight hours (Willcox, 1952). The present paper concerns 46 cases of uncomplicated gonorrhoea treated with two grammes of terramycin given orally as two capsules (500 milligrammes) four times a day after the main meals for twenty-four hours.

#### The Cases.

Forty-three of the patients were male and three were female, 32 were single and 14 were married. The average age was 30.4 years (extremes eighteen and fifty-five years). Twenty persons had had no previous experience of venereal disorders, but 26 patients had had no less than 49 previous venereal episodes (38 of gonorrhoea, fear of syphilis and seven of non-specific urethritis). Five of the males were Negroes from West Africa or the West Indies, of whom two denied having previous venereal disease, while three had had eight attacks of gonorrhoea and one of syphilis between them.



Of the 43 males, 30 had noticed a discharge for one to three days before seeking advice, seven for four to seven days, three for eight to fourteen days, and two for longer periods. One patient had not noticed his discharge. Dysuria was admitted by 26 male patients. Five males had been unsuccessfully treated with penicillin for gonorrhoea within the immediate two weeks, relapses or reinfections following the use of that antibiotic. The Wassermann and Kahn tests both produced negative responses in 44 cases, and in two the Wassermann test produced a negative response but the Kahn test gave a positive reaction on the occasion of the first visit. The gonococcal complement fixation test was performed on sera from 31 patients and the result was negative in 28 instances. Only three persons, one of whom was a female, gave a positive result, indicating the limited value of this test in acute gonorrhoea at the present day.

### The Results.

Six patients did not attend after treatment. Of the 40 followed, 38 were observed for four to seven days, 32 for eight to fourteen days, 29 for fifteen to twenty-eight days, and 26 for longer than this time. The status of 31 patients was entirely satisfactory at the times when they were examined. There were only three definite failures, in which gonococci recurred in the smears in the face of denial of further sexual exposure (two at seven days and one at twenty-three days respectively). There was also one reinfection at fifty-nine days. In addition, five patients later developed non-specific discharges in which gonococci were not found. These were considered to be infections with non-specific urethritis and unconnected with the gonorrhoea. Four of these were noted at twenty-one, twenty-nine, thirty-five and thirty-five days respectively, and one at 132 days which followed a fresh exposure. With the longer incubation period of non-specific urethritis, its occurrence after the apparent cure of gonorrhoea does not necessarily imply that further sexual contact has taken place, as the two diseases may be acquired simultaneously. However, it is interesting to note that terramycin, which is curative in established non-specific urethritis, apparently did not act as a prophylactic in some of these cases.

Of the four patients with relapses and reinfections, two were treated again with penicillin and two were treated again with the same dose of terramycin. One of the latter patients, after an initial response, relapsed a second time one week later and was given penicillin. The other reacted satisfactorily, but developed non-specific urethritis, probably as a result of admitted reexposure, at 111 days.

The treatment was generally free from side effects, although four patients developed the ano-rectal syndrome of burning and pruritus which has already been described (Willcox, 1951b).

The results are summarized in Table I.

TABLE I.  
Status at Last Examination or Previous Failure.

Days.	Total Followed.	Failures (Gonococci Recurred).	Reinfections.	Non-Specific Urethritis.
0 .. ..	46	—	—	—
1 to 3 ..	40	—	—	—
4 to 7 ..	38	2	—	—
8 to 14 ..	32	—	—	—
15 to 21 ..	30	—	—	1
22 to 28 ..	29	1	—	1
29 to 35 ..	26	—	—	2
36 to 42 ..	21	—	—	—
42 to 49 ..	19	—	—	—
50 to 56 ..	17	—	—	—
57 to 63 ..	15	—	1	—
64 to 70 ..	12	—	—	—
71 to 77 ..	10	—	—	—
78 to 84 ..	8	—	—	—
101 to 106 ..	4	—	—	—
132 .. ..	1	—	—	1
Total ..	—	3	1	5

### Summary.

Of 46 patients with uncomplicated gonorrhoea treated with two grammes of terramycin in four divided oral doses over twenty-four hours, 40 were followed for varying periods up to 132 days. There were three relapses and one reinfection, for which further treatment was required. In addition, there were five patients showing non-gonococcal discharges which were considered to be due to infections with non-specific urethritis.

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### NEWER METHODS OF ELECTRICAL TESTING IN NERVE LESIONS (I-T CURVES).<sup>1</sup>

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FOR over a century the galvanic-faradic test has remained the classical method for electro-diagnosis in nerve lesions and it still remains the preliminary routine method in such cases.

In lower motor neuron lesions Wallerian degeneration is accompanied by changes in the response of muscle and nerve to electrical stimulation. These abnormalities in response are known as reaction of degeneration and are not fully developed until ten to fourteen days after the lesion—a point of considerable practical importance in carrying out such tests.

Normal muscle responds to galvanic or direct current by a momentary twitch at make or break of the current only, and there is no contraction while the current is flowing steadily. The normal polar formula is as follows: cathode closing contraction is greater than anode closing contraction, which is greater than anode opening contraction, which is greater than cathode opening contraction. Moreover, the contraction is greatest when the active electrode is placed over the motor point of the muscle.

Faradic current is an alternating current, with 100 peaks per second, and so with faradic stimulation the muscle stays contracted in a state of tetanus as long as the current flows.

Stimulation of the nerve trunk produces similar responses in the muscles supplied distal to the point of stimulation.

Complete reaction of degeneration is found in complete lower motor neuron lesions and is characterized by an absence of response of the nerve trunk to stimulation by either current and an absence of response of the muscle to faradic current; but there is a characteristic slow, sluggish contraction to galvanic stimulation of the muscle itself.

In long-standing cases of complete reaction of degeneration all response to electrical stimulation is lost, and this is known as absolute reaction of degeneration. In such cases there is no hope of recovery, since most of the muscle has become converted into fibrous tissue.

In partial lesions, during the development of a progressive lesion, or during recovery of a complete lesion, we find partial reaction of degeneration. In such cases there is evidence of reaction of degeneration, such as a sluggish response of the muscle to galvanic stimulation; but the abnormalities fall short of the picture presented in complete reaction of degeneration.

This classical galvanic-faradic test is still in experienced hands a most satisfactory routine method of electrical testing; but it suffers from the following disadvantages:

<sup>1</sup> Read at a meeting of the Australian Association of Physical Medicine on August 25, 1952, at Melbourne.

(1) In some cases the result of the test is equivocal, and the diagnosis may remain in doubt. This is particularly the case in suspected mild degrees of partial reaction of degeneration. (ii) Being a qualitative and not a quantitative test, it does not permit of accurate following up of progress. (iii) It is not a sensitive method for the detection of early signs of recovery. Despite these disadvantages, it will in the majority of cases indicate the presence or otherwise of a lower motor neuron lesion, thus assisting differential diagnosis in cases of paresis. It also indicates the site of the lesion; and, lastly, by indicating the extent of the lesion it is a valuable help in prognosis. The prognosis, for example, of Bell's palsy is greatly influenced by the results of testing at two or three weeks.

Nevertheless it is apparent that in difficult diagnostic problems and in following up progress in nerve lesions some additional help must be obtained, and there have been several steps in this direction.

Delherm and Nion in Paris attempted to extend the scope of the galvanic-faradic test by estimation of the threshold current.

In condenser testing, galvanic current was used as the stimulus, the duration of the stimulus being varied by discharging through the patient condensers of varying capacities. This method had only a limited success and became replaced by the determination of chronaxie—this being known as chronaximetry. This latter method represented a definite advance; it offered the great advantage of giving the result as a definite figure. However, as will be seen later, if used by itself it could easily lead to erroneous conclusions and it has now become replaced by the determination of I-T (intensity-time or strength-duration) curves.

More recently there have been developed two methods which are now accepted as valuable aids in electrodiagnosis.

The first of these is electromyography; it permits of visual and auditory study of action potentials in muscles, in a somewhat similar way to the study of action potentials in cardiac muscle in electrocardiography, or of the brain in electroencephalography. It has proved a valuable research weapon; but its routine use in clinical work presents certain technical problems; particularly with regard to equipment, time and assistance.

The alternative method of studying the response of muscle to galvanic currents of predetermined strength and duration (I-T curves) is adopted in many overseas clinics; it is the method we have adopted, because it is simple and inexpensive, and can readily be carried out even in a busy department. Before such curves are studied it is necessary to review briefly some of the factors involved in the response of muscle to galvanic current and stimulation.

Normally there is a response only at make or break of the current, and there are two factors which determine whether there is a response to stimulation. These two factors are the strength of the current and the duration of flow, and a certain minimum or threshold is necessary in each case in order to evoke a response; but the threshold of one factor varies with the value of the other.

The rheobase is defined as the minimum strength of current which, flowing for an infinite time (in practice 0.1 second or 100 milliseconds) will evoke a response. The normal rheobase varies from 15 to 25 volts, or from two to eight milliamperes; but there is considerable variation in the normal, and it tends to be much higher in distal muscles (particularly in the leg) than in proximal muscles—for example, in the face.

The chronaxie is the minimum time for which a current twice the strength of the rheobase must flow in order to evoke a response. Here again there is considerable variation, and even the method of testing has a pronounced effect upon the result; but normally the chronaxie is less than one millisecond.

The ratio between cathodal and anodal rheobase is known as the galvanic polar ratio and is normally 1:2.5 or greater.

Erb in 1868, in his description of reaction of degeneration, referred to the characteristic sluggish response to galvanic stimulation, and later Mendelssohn explained the gradual development of this following a lower motor neuron lesion. In the first week there were an increase in the latent period and a lessening of amplitude, but the wave form remained unchanged. In the second stage, irritability of muscle and nerve to faradic current vanished; but muscle showed increased irritability to galvanic current, the amplitude was increased, and the relaxation period was lengthened. A plateau appeared between the height of contraction and the beginning of relaxation. In the third stage both contraction and relaxation were slow, giving the classical picture of a true "worm-like" contraction. Erb himself noted that this sluggish contraction often persisted as a tetanus, and this was referred to by the older writers as galvanotonus and regarded rightly as a feature in some cases of reaction of degeneration.

It is now realized that such a tetanic response to galvanic stimulation can occur in normal muscle if the current strength is sufficiently great, though this often involves considerable discomfort on the part of the patient. The ratio between the threshold current to produce tetanus and the threshold to produce a simple contraction (rheobase) is known as the galvanic tetanus ratio and is normally 4:0.1:0. The difference in reaction of degeneration is that this tetanic contraction is obtained much more readily, because in reaction of degeneration the galvanic tetanus ratio is reduced and may approach unity.

The development of the "squegging oscillator" and the gas triode valve has resulted in the production of modern electronic stimulators which are capable of producing rectangular pulses of galvanic current, the strength and duration of which can be predetermined. By selecting different time values and determining the minimum strength of current necessary at each time interval to evoke a response, it is possible to join up the plotted points on a graph and thus produce an I-T curve. The time intervals are plotted along the ordinates of the graph and the strength of current is plotted along the abscissae. The time intervals are shown in milliseconds, but the strength of current may be expressed either as voltage or as milliamperage. Therefore, two types of electronic stimulator have been developed, as follows.

1. In the constant current type the rectangular pulse is stabilized to give predetermined current strengths, recorded in milliamperes. Constant intensity for variable patient loads is ensured by using a high output impedance, usually supplied by a pentode valve. This type of machine is very accurate and simple in design; but it does entail some discomfort on the part of the patient.

2. In the constant voltage type the pulse is stabilized to give predetermined voltage, and constant output is maintained by the use of a low output impedance or a low-value impedance shunting the output terminals. This type of machine is more comfortable for the patient but skin resistance must be kept at a minimum in order to avoid inconsistent results.

There is much argument about the relative merits of these two types of stimulator and there is probably not a great deal between them, though it is important to note that the value obtained for chronaxie with the constant voltage type is considerably lower (as low as 1 in 10) than that obtained with the constant current type.

The instrument used in this demonstration is a Newton Victor stimulator of the constant voltage type, and it provides for current flow periods of 100.0, 10.0, 1.0, 0.5, 0.1, 0.05 and 0.02 milliseconds. The pulse frequency is also adjustable between 0.5 and 1000.0 cycles per second, but for simplicity in this paper it has been kept constant at a frequency of 1.5 cycles per second. Voltage is adjustable by means of a continuously variable control, calibrated in volts. An audible signal indicates the arrival of each pulse.

Some authorities graph the strength of current logarithmically in terms of multiples of rheobase, and the graph then appears as straight lines rather than as curves. This method does introduce certain complexities, and I

have therefore followed the usual practice and graphed current directly along abscissæ.

In Figure I are seen some examples of normal I-T curves. Rheobase is the voltage required at 100 milliseconds; chronaxie is determined by taking a point on the curve corresponding to a voltage twice the value of the rheobase. What are the characteristics of the normal I-T curve? (i) The curve is a continuous one, almost flat, with a slight upward trend in voltage when short duration stimuli are employed—that is, at the extreme left of the curve. (ii) The rheobase is effective for durations as low as 10 milliseconds—that is, the curve is flat from 10 milliseconds

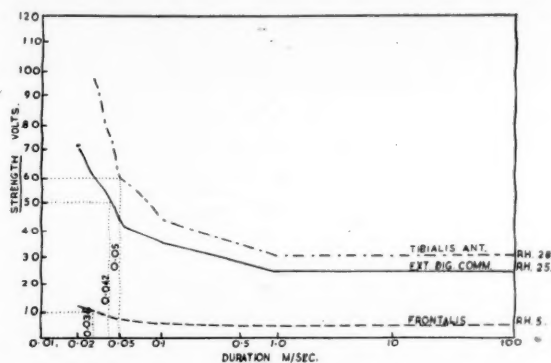


FIGURE I.

onwards to the right. (iii) The threshold value at one millisecond is less than twice the rheobase. (iv) The necessity to increase current for stimulation occurs between 10 milliseconds and one millisecond. (v) The value for chronaxie is below one millisecond, and with this type of instrument it usually lies within the range of 0.01 to 0.1

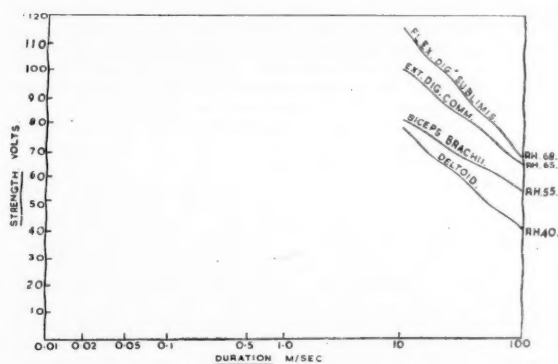


FIGURE II.

millisecond. (vi) The value for rheobase lies within or near to the normal limits of 15 to 25 volts; but it will be seen in Figure I that there may be considerable variation in this figure. The rheobase for proximal muscles is low; in the frontalis it is five volts with a chronaxie of 0.038 millisecond; in *extensor digitorum communis* it is 25 volts, chronaxie 0.042 millisecond; in the example of *tibialis anterior* rheobase is 28 volts and chronaxie is 0.05 millisecond.

It follows that the height of the curve (which is determined by the value for rheobase) is not in itself of great significance.

In Figure II are seen curves for denervated muscles, which show complete reaction of degeneration in the galvanic-faradic test.

The characteristics of the I-T curve in fully denervated muscle are seen to be as follows. (i) The curve is a continuous one, but is displaced upwards and to the right. (ii) The rheobase becomes ineffective for durations much less than 100 milliseconds. (iii) The threshold value for one millisecond is so high that it is virtually unobtainable, and the responses are sluggish. (iv) The necessity to increase the current for stimulation occurs long before 10 milliseconds. (v) The chronaxie is greatly increased—above one millisecond. (vi) The height of the curve is increased, owing to an increase in rheobase; but this in itself is not of great importance. However, it will be

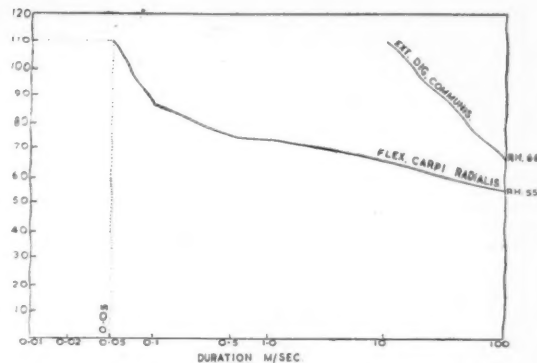


FIGURE III.

apparent that the profile of the curve slopes upward much more sharply, and there is practically no horizontal portion.

We thus have two extreme types of curve—the normal I-T curve found in normal muscle and the I-T curve found in

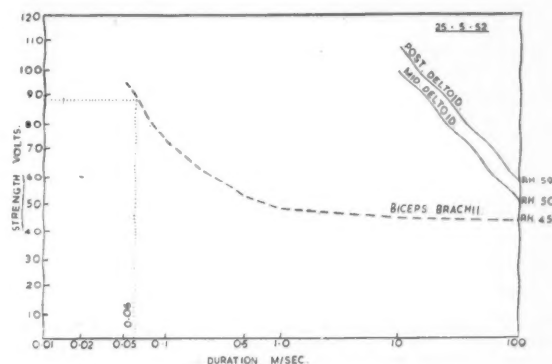


FIGURE IV.

denervated muscle. Between these two extremes we have a variety of intermediate types found in muscles which are partially denervated—that is, those showing partial reaction of degeneration only.

Alteration from one type of curve to another indicates progressive denervation or recovery, according to the trend of the changes. The interpretation of these changes is not always simple, and in order to understand them it is necessary first to refer briefly to the work of Pollock *et alii*, who studied the response of muscle to electrical stimulation during the progressive phases of degeneration, denervation and regeneration after experimental nerve section. Their results may be summarized as follows. (i) Degeneration: rheobase rises early, then falls. Chronaxie first increases, then decreases, then increases again.



There is a discontinuous curve. (ii) Denervation: rheobase remains low, chronaxie remains large. There is a continuous I-T curve, with a time factor characteristic of slowly responding tissues. (iii) Regeneration: rheobase is high and the curve is discontinuous. Chronaxie is diminished late.

Signs of recovery are of course of great importance and may be summarized as follows. (i) A displacement of the curve downward and to the left. Since a rise in rheobase is a common early sign of recovery, the right-hand portion

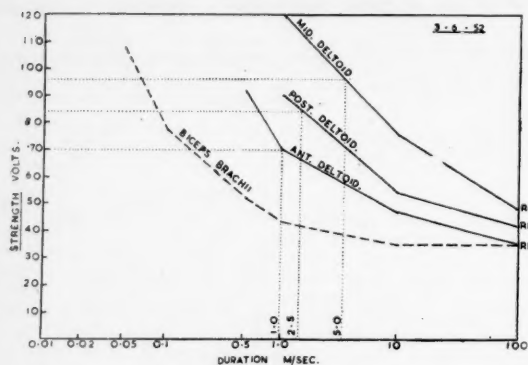


FIGURE V.

of the curve often rises, but there is a relative lowering or flattening of the left-hand part of the curve. (ii) A rise in rheobase, which is often an early sign. (iii) Discontinuity in the curve (provided the muscle is not in the early phase of degeneration). It has been pointed out that a continuous curve is found only in normal muscle or in the phase of denervation, whereas discontinuity exists either in the

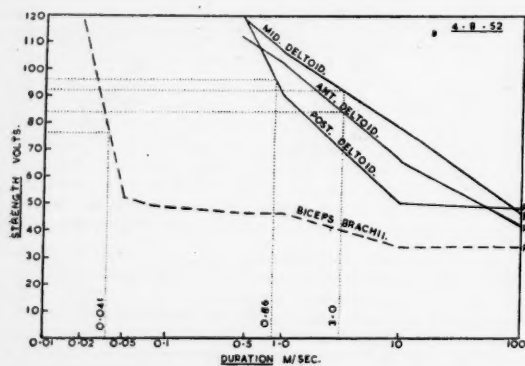


FIGURE VI.

early phase of degeneration or during regeneration. (iv) Diminution in chronaxie, which occurs late and is not an early sign of recovery.

A few examples will serve to indicate the value of I-T curves as an adjunct to galvanic-faradic testing, either for purposes of diagnosis or for detecting signs of recovery.

In Figure III are shown the I-T curves for *flexor carpi radialis* and *extensor digitorum communis* in a male, aged twenty-one years, who had sustained a fracture of the humerus one month previously. Clinically he had radial and median palsy with no voluntary power. In the case of *extensor digitorum communis* there was no faradic response but a sluggish galvanic response, indicating reaction of degeneration. In *flexor carpi radialis* there was a weak normal faradic response, with a quick galvanic response, and cathode closing contraction was equal to

anode closing contraction. The galvanic-faradic test therefore failed to confirm the clinical presence of median nerve involvement. The curves demonstrate the presence of reaction of degeneration in *extensor digitorum communis*, the curve being characteristic of denervated muscle. The curve for *flexor carpi radialis* is discontinuous, indicating median nerve palsy; but the high rheobase, together with a chronaxie not unduly great, indicates that recovery is proceeding. This was confirmed a week later by the first signs of return of voluntary flexion, and over the next three weeks median power rapidly returned, although radial palsy remained stationary, as was to be expected with an I-T curve characteristic of denervated muscle. In such a case the usual process of regeneration is at best a slow one.

The second case (Figures IV, V and VI) was that of a male patient, aged thirty-three years, who on January 10, 1952, sustained a compound fracture of the right clavicle

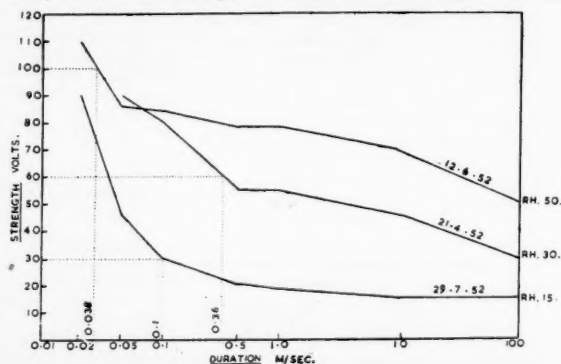


FIGURE VII.

with a brachial plexus lesion. For simplicity, our observations in this case are restricted to the deltoid and biceps. On March 19 there was no voluntary power in either biceps or deltoid, and in each case there was no response to faradic current, but a sluggish response to galvanic current, demonstrating the presence of reaction of degeneration. On May 25 there was still no sign of voluntary power, except for a questionable flick in the biceps. Galvanic-faradic testing showed an improvement in the reactions—the galvanic response was unchanged, but there was a very weak response to faradic stimulation of both deltoid and biceps. However, it was not possible by this means to detect any difference between the degree of innervation of these two muscles, although clinically there was a suggestion of voluntary power in the biceps. At the same time I-T curves were plotted (Figure IV). The curves for the deltoid indicate denervation, as is shown by the displacement of the curve upwards and to the right, by the steep slope, and the inability to determine a threshold value for one millisecond. The curve for the biceps, however, approaches normal, even though chronaxie for this muscle is rather high, and under these circumstances the high rheobase is a good prognostic omen. It was therefore possible to foretell a rapid recovery in this muscle. On June 3 this was confirmed by the observation of voluntary power 2 in the biceps, and there was a faint flicker in the deltoid. Galvanic-faradic testing at this time revealed no change; but the I-T curves show an improvement, which is pronounced in the case of the deltoid. It will be seen that the curves for the deltoid are displaced downwards and to the left; the threshold is now obtainable at one millisecond, and a value can now be established for chronaxie. The chronaxie for the deltoid is still sufficiently great to demonstrate some denervation, as is also shown by the shape of the curve. The only change in the curve for the biceps is a lowering of rheobase and an increase in chronaxie from the previous figure of 0.06 to 1.6 milliseconds. This increase in chronaxie of itself may be thought to be a bad sign unless the complete curve is studied, and it only serves to demonstrate the fallacious deductions that may so easily be drawn from chronaxie

measurement alone, and the immense superiority of studying the curve as a whole.

In Figure VI are seen the curves obtained on August 4. The curve for the biceps has flattened out at the left-hand side, with a reduction in chronaxie to 0.04 millisecond, and is approaching normal. Voluntary power had increased to power 5 in the biceps and 3 in the deltoid. The curves for the deltoid may at first glance look no better—in fact they may look a little worse, until it is realized that not only has the chronaxie been reduced in each case, but a threshold value is now obtainable for a time duration as small as 0.5 millisecond.

In Figure VII are seen the I-T curves for *abductor minimi digiti* in a case of a recovering post-traumatic ulnar nerve lesion. On April 21, 1952, there was a slight flicker in the muscle on attempting voluntary movement. Galvanic-faradic tests showed a weak faradic response and a sluggish galvanic response. The curve is discontinuous and since the lesion was a year old it can be presumed that this indicates regeneration and not degeneration. (In denervation the curve is continuous.) The rheobase is rather high; the chronaxie of 0.36 millisecond shows there is still considerable denervation.

On June 12 there was a little increase in voluntary power, but no change in the result of the galvanic-faradic test. However, the I-T curve shows improvement. The placement of the curve at a higher level is due to an increase in rheobase from 30 to 50 volts, and such a rise in rheobase is not a bad sign; in fact, it is often a sign of recovery. Moreover, the curve has flattened out at the left-hand side, with a reduction in chronaxie from 0.36 to 0.038 millisecond.

On July 29 there was a further increase in voluntary power and the I-T curve had approached normal as regards shape and contour. It is true there was another rise in chronaxie, and this again demonstrates the importance of studying the curve as a whole and not one isolated point on it.

In order to keep this paper to a clinical level many other problems have been omitted—for example, the study of intensity-frequency curves, the behaviour of muscle response to progressive currents *et cetera*; but the study of such problems requires more elaborate apparatus and remains a matter for research rather than for clinical use. Pollock, who has done a great deal of work in this field, also notes that during denervation galvanic polar ratio and galvanic tetanus ratio remain low, and that they rise during regeneration, and he considers that a rise in galvanic tetanus ratio is often the earliest sign of recovery.

#### Conclusion.

In conclusion, it can be said that although the classical galvanic-faradic test is still a useful method in experienced hands for routine testing, it has its limitations. In difficult diagnostic problems and in the follow-up of progress in nerve lesions the study of I-T curves is an invaluable adjunct and far superior to chronaximetry. The problem is not a simple one. Years ago, Bauwens pointed out that although such methods give the result as a definite figure and curve, the assessment of underlying pathology and function is not such a simple problem. Different methods give a variety of viewpoints on a problem which cannot be accurately solved by any one method alone.

It must be realized that in the study of I-T curves it is only too easy to form erroneous conclusions. Common misconceptions are that a lowering of the curve indicates recovery, that a high rheobase is a sign of an irrecoverable lesion, that recovery is indicated early by a reduction in chronaxie.

In order to minimize such errors consideration must be given to all the factors involved, with a due appreciation of the peculiar variations that occur during the successive phases of degeneration, denervation and recovery.

#### Acknowledgement.

I am deeply grateful for the enthusiastic cooperation of my senior physiotherapist, Miss Muriel Ross, who has been responsible not only for the preparation of the graphs, but

for a great deal of the work involved in carrying out the tests.

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#### Reviews.

**Emergencies in Medical Practice.** Edited by C. Allan Birch, M.D., F.R.C.P.; Third Edition; 1952. Edinburgh and London: E. and S. Livingstone, Limited. 8½" x 6", pp. 600, with 143 illustrations, 15 in colour. Price: 32s. 6d.

FOR this edition every section has been revised and obsolete parts have been omitted: each chapter has been most carefully scrutinized so as to make it more helpful than in the previous edition. Valuable advice is given in the paragraph on rape and on "emergency statements" and on certain aspects of death: among other additions are appendices dealing with vaccines, sera and anti-venenes. Anti-coagulant therapy is discussed and recommended in the appropriate sections. The pages dealing with pulmonary embolism and with coronary spasm are well worth study by all practitioners. As in the previous editions, the author and his colleagues have provided an invaluable fund of information and practical advice for all practitioners as well as an indispensable book of reference for the neophyte. This is a most valuable book especially for the practitioner of under ten years' standing.

**The Spread of Tumours in the Human Body.** By R. A. Willis, M.D., D.Sc. (Melbourne), F.R.C.P. (London); Second Edition; 1952. London: Butterworth and Company (Publishers), Limited. Sydney: Butterworth and Company (Australia), Limited. 10" x 7", pp. 484, with 85 illustrations. Price: £4 4s. 6d.

IN the second edition of "The Spread of Tumours in the Human Body" by R. A. Willis there has been a change of publisher and the book is recast in a style similar to that of the same author's "Pathology of Tumours". Since the first edition the author has increased his material from 323 to 500 personally performed cancer necropsies. This together with the addition of 260 new references has expanded the text somewhat. The illustrations, which are mainly photographs of gross specimens and photomicrographs together with a few diagrams and X-ray photographs, have been reduced in number from 103 to 85. Their reproduction has improved, but instead of accompanying the text they are now situated at the end of the book.

This book is a classic of its type and all who are interested in neoplastic disorders will find it most useful, the surgeon and physician as well as the morbid anatomist. It deals with facts and in this feature lies its virtue.

Every book conveys a picture of some aspect of the author's personality and the reader of this book will be struck by the meticulous care with which Willis performs an autopsy. He is therefore able, with clear logic, to point out the illogicalities into which even the most eminent have fallen. For example, the often quoted primary melanoma of the suprarenal is shown to have little evidence of existence.

The possibility of spread of cancer by the vertebral plexus of veins is given scant attention in favour of the passage of tumour cells through the lungs and thence to the brain. One of the most valuable chapters is that on latent primary growths. This has important practical considerations to the surgeon and especially to the neurosurgeon who is relatively frequently presented with a patient having the symptoms of a primary intracranial growth which is really a metastasis from a small bronchial carcinoma or an insignificant melanoma of skin.

This book can be wholeheartedly recommended.

**Synopsis of Genitourinary Diseases.** By Austin I. Dodson, M.D., F.A.C.S., and Donald L. Gilbert, M.D.; Fifth Edition; 1952. St. Louis: The C. V. Mosby Company. Melbourne: W. Ramsay (Surgical) Proprietary, Limited. 8" x 5", pp. 314, with 122 illustrations. Price: £2 2s.

THE fifth edition of Dodson and Gilbert's book follows the same pattern as the previous editions, but it has been brought well into line with modern therapeutics and minor changes have been made throughout the book. Although not well known in this country, it has enjoyed considerable popularity in the United States, as evidenced by the fact that the Fourth Edition of 1945 was reprinted twice. As a synopsis it is a good book, easy to read with a detailed index, and the subject matter is very reliable. The first two chapters on diagnosis, instruments and minor urological procedures are excellent, and will probably be the most useful sections for its Australian readers. But students will require little more than they will find here, and a considerable portion of the book could be very useful to the qualified practitioner.

Prostatic enlargement is still referred to as "hypertrophy" and "hypernephroma" is the pigmented cell renal carcinoma. However, in both cases the microscopic pathology given is in accord with modern ideas. The authors still drain the distended bladder by removing ten ounces of urine at a time, and do not make the point in diagnosis that in this state the prostatic outlines are almost impossible to define on rectal palpation.

However, for those needing such a synopsis this book can be recommended as a clear, concise and authoritative outline of present-day urology.

**Logan Turner's Diseases of the Nose, Throat and Ear.** Edited by Douglas Guthrie, assisted by John P. Stewart, with the collaboration of Charles E. Scott, A. Brownlie Smith, I. Malcolm Farquharson, I. Simson Hall, R. E. Lumsden and J. F. Birrell; Fifth Edition; 1952. 9" x 6", pp. 492, with 246 illustrations, nine in colour. Price: 42s.

LOGAN TURNER'S "Diseases of the Nose, Throat and Ear", under the authorship of seven prominent oto-rhino-laryngologists of the Edinburgh school, now appears as a completely revised fifth edition. The work, originally based on Porter's little book on the nose, throat and ear produced in 1912, is now edited for the several writers by Douglas Guthrie, assisted by J. P. Stewart. Throughout the many reprintings, revisings and enlargements under the editorship of Logan Turner, this text has always comprised a masterly and explicit summary of the diseases and disorders of this special department of medicine. The fifth edition now published continues to maintain the same qualities, while it includes a clear account of recent advances in theory and methods of treatment. There are excellent anatomically based descriptions of the standard methods of examination. In any text-book there will always be found some points for criticism. The use of adrenaline with cocaine for decongestive packing in acute sinusitis is recommended. The subsequent return of the waterlogged state of the mucosa is referred to. Most experienced rhinologists would refrain from the application of adrenaline owing to the tendency to intense secondary congestion and watery rhinorrhoea after its use. The newer vaso-constrictor agents such as "Neo-synephrin" are preferable to adrenaline for the purpose.

Considerable space has been devoted to the local treatment of tuberculous laryngitis. The very satisfactory response often to be obtained from streptomycin and PAS therapy appears to have been overlooked. This form of therapy is referred to in relation to the treatment of tuberculous ulceration of the pharynx by a different author. The description of post-operative care of a patient after tracheotomy is quite inadequate. All who have had to handle these patients know that the post-operative care in keeping the tubes clean and the trachea free of exudates is a painstaking task which every student and practitioner should thoroughly understand. Such conditions as injuries to the larynx should be more precisely described and measures to prevent stenosis

might be outlined. There is a good description of endoscopic procedures and recent advances in thoracic surgery are referred to.

The physiology of the auditory and of the vestibular apparatus is well outlined. Modern methods of testing the hearing and the vestibular functions are adequately and clearly described. The subject of deafness and its alleviation is concisely presented and includes the most up to date conceptions of the subject.

That this deservedly popular British text will continue to be held in high esteem is certain. While the work has grown still further beyond the small and compact text which Porter originally presented for students and general practitioners, nevertheless a wider scope of useful reference is now presented for the student specialist and for the practitioner who does require a fairly extensive treatise for his library.

**Methods in Medicine: The Manual of the Medical Service of George Dock, M.D., Sc.D.** By George R. Herrmann, M.D., Ph.D.; Second Edition; 1950. St. Louis: The C. V. Mosby Company. Melbourne: W. Ramsay (Surgical) Proprietary, Limited. 9" x 6", pp. 496. Price: 78s. 9d.

THIS book was originally designed as a manual for students and interns in the University of Texas Hospitals and Medical School, as a guide to the investigation and management of cases in the wards. It commences with a very short section setting out the requirements of the taking and recording of the history and bedside examination. There follows a very large section on clinical laboratory procedures—blood examinations, urine tests, and faeces, sputum and body fluid examinations. In the third part, special investigations indicated in disorders of the several systems are detailed at some length. This is, in fact, the largest section of the book and seems more detailed than is required in a handbook intended for the student and intern, and yet not sufficient in technical detail or critical evaluations for the full-time laboratory worker. In the fourth section a summary of therapeutic procedures is given, particularly helpful being the chapters dealing with the management of patients in coma, and the treatment of medical emergencies. However, the part on general therapeutics has not done justice to the subject owing to limitations of space. Finally, there is a fairly detailed account of dietetic methods, with appropriate diet sheets appended.

Although this book contains a great deal of useful and up-to-date information, our feeling is that it has become something more than the handbook it was designed to be, and yet in no way can it be regarded as a text-book—it is a book of detail rather than of ideas.

**What the General Practitioner Ought to Know About Human Actinomycosis.** By V. Zachary Cope, M.S., F.R.C.S.; 1952. London: William Heinemann (Medical Books), Limited. 7½" x 5½", pp. 92, with 32 illustrations, a few in colour. Price: 12s. 6d.

THIS is a very interesting contribution written for the general practitioner on a rare but interesting subject. The book is small, only seventy pages, but is well set up and printed and contains many illustrations in colour as well as black and white, to demonstrate the pathology of the disease and its manifestations in the various organs and anatomical areas of the body. The author is at some pains to point to the carious tooth as the most important source of entry of actinomycosis, and he asserts that it is possible to abolish actinomycosis. Surgery as a factor in the treatment of this disease is steadily diminishing; moreover iodine and sulphadiazine are rapidly giving place to penicillin. The author is strongly of the opinion that the most important consideration in the eradication of actinomycosis is the extraction of every carious tooth, at the same time using penicillin as an adjuvant in dealing with a septic field.

**Fibre Systems of the Brain and Spinal Cord.** By M. K. Wright, M.Sc., M.B., B.Ch.; 1952. Johannesburg: Witwatersrand University Press. 11" x 8", pp. 103, with 53 illustrations.

THIS little atlas aims primarily to serve as a supplement to classes of practical neuroanatomy, where limitations of time render dependence upon formal text-books inconvenient. The work is divided into three parts: the first is introductory, mainly on principles of neural organization; the second surveys the chief fibre systems throughout the central nervous system; the third is an atlas of photographs of coronal and sagittal sections stained by the Weigert-Pal method. The third part differs in no essentials from similar sections in other books and provides the student with a



normal guide to his classroom material. The main purpose of the book is conveyed in the first and second sections. These comprise simple line diagrams with a brief explanatory text. The diagrams illustrate both long and short circuits, more or less in isolation; for the most part they follow accepted patterns and call for little comment, although it is interesting to note the prominence given to "reticular" formations and their connexions. It is easy to criticize individual features: for example, the propriety of including the spinthalamic tracts in the lateral lemniscus or the occasional obscurity of orientation. Also, present views merit greater attention to the segmental arrangement of the long tracts in the spinal cord. However, the book answers its avowed purpose well enough and there is no doubt that the students for whom it is designed will find it helpful.

**A Method of Anatomy: Descriptive and Deductive.** By J. C. Boileau Grant, M.C., M.B., Ch.B., F.R.C.S. (Edin.); Fifth Edition; 1952. Baltimore: The Williams and Wilkins Company. Sydney: Angus and Robertson, Limited. 10½" x 7", pp. 894, with 862 text figures. Price: 75s. 3d.

THE progressive expansion of Grant's book from an original of simplicity, charm and freshness to its present pretentious form has been deplored in previous notices. The fact that in the fifth edition an increase in the number of illustrations is not accompanied by any increase in text comes, therefore, as a relief. One of the major penalties of the author's effort towards completeness has been some uncritical acceptance of the work of others. We have long felt that the book would gain in value were the author better acquainted at first hand with some of the work he quotes; a tidying up along these lines could be a feature of the next edition. In the present edition the new illustrations are distinguished by a higher artistic quality—perhaps at the expense of some diagrammatic clarity—but they are, as always, very good. Of a number of minor changes, we may select for approval the greater prominence now given to the work of Greulich and Thoms on the female pelvis. While on this subject we may add, incidentally, that in our experience the value of the oft-quoted preauricular sulcus as a guide to the female pelvis is greatly exaggerated. For the rest, the author is at his best when clarifying some problem in purely human anatomical mechanics, less secure when citing the conclusions of others and at his worst when he ventures into the fields of anthropology and comparative anatomy. What might be called a diagrammatic assurance in the text matches the quality of the illustrations. However, this feature which so disturbs the well-informed anatomist delights the student, and there is little doubt that the book will preserve its popularity.

**Surgery of the Oesophagus.** By R. H. Franklin, M.B., B.S., F.R.C.S.; 1952. London: Edward Arnold and Company. 9" x 6", pp. 234, with 86 illustrations. Price: 42s.

"SURGERY of the Oesophagus", by R. H. Franklin, comprises 22 short chapters covering various aspects of the surgery of the oesophagus and in his preface the author states that the work was written especially for the experienced general surgeon. In this sense the chapters on atresia of the oesophagus and the treatment of benign and malignant strictures of the oesophagus are useful. In the others the experienced surgeon will find little to edify him, but he might well examine the illustrations which are excellent and numerous.

In some of the sections, for example that on oesophageal varices, the subject matter verges on the trivial and would hardly instruct a medical student. A protest may also be made against the author's method of using references. For example, after a short chapter on cardiospasm in which only 12 authors are cited a bibliography of some 90 papers is given.

**Child Rorschach Responses: Developmental Trends from Two to Ten Years.** By Louise Bates Ames, Ph.D., Janet Learned, M.A., Ruth W. Métraux, M.A., and Richard N. Walker, M.A.; 1952. New York: Paul B. Hoeber, Incorporated. 9½" x 6½", pp. 324, with seven text figures. Price: \$7.50.

"CHILD Rorschach Responses", written by a team of psychologists from the Gesell Institute of Child Development, adds another compendium to the already impressive list of work on normal child performances from this centre. The book shows the average Rorschach performances of samples of children ranging from two to ten years. Fifty children, 25 boys and 25 girls, were obtained at each of thirteen different age levels: half-yearly levels from two to six years, and annually thereafter to ten years of age—a total of

650 children examined. More than half of the children were members of the research group that had been followed for many years at the Clinic. The Rorschach material is scored and tabulated, and averages are given with each age sample. Little attention is paid to the range of the scores in each sample and remarks on the psychological significance of the material presented are somewhat superficial. This emphasis on simple statistics and the lack of appreciation of the complexity of the material, in a psychological sense, are the real weaknesses of the book, which teaches us little about children or about the Rorschach method. Normal, well-adjusted children are so different, one from another, that a technique of presenting averages has little meaning for the worker with individual children. For the theorist who may be seeking general laws of perceptual development in children this collection is of value in showing developmental trends in the restricted situation of the Rorschach examination, and the data could, no doubt, be correlated with other measures of the same children, were they made available.

**Textbook of Medicine for Nurses.** By J. W. Joule, M.D., M.R.C.P.; 1952. London: H. K. Lewis and Company, Limited. 8½" x 6", pp. 516, with 48 illustrations. Price: 30s.

A NEW addition to the nurse's bookshelf is this book by J. W. Joule. Adequate details of all diseases are included, especially as would be expected with emphasis on the therapeutic side without too many details in diagnosis which are not specifically within a nurse's orbit. The book opens with chapters on diet in health and disease, bowel action, observations on the urine, and insomnia, and then each bodily system is discussed separately; the book concludes with discussions on drugs and their uses (and poisoning therefrom) and a description of special procedures such as blood transfusion, lumbar puncture and artificial pneumothorax.

Whilst the author has always considered the practical side of medicine that is necessary for nurses to know, yet a nice balance of detail is preserved and as the book is written in an easily read style all nurses will find it a welcome aid to their studies. Perhaps a larger and better chosen series of illustrations and diagrams would enhance future editions. Both tutor sisters and lecturing physicians will find that they can use and recommend this book with confidence that it will aid both themselves and their pupils.

**William Smellie: The Master of British Midwifery.** By R. W. Johnstone, C.B.E., M.A., M.D., Hon. LL.D.; 1952. Edinburgh and London: E. and S. Livingstone, Limited. 9" x 6½", pp. 148, with 30 illustrations. Price: 20s.

RIGHT at the end of the seventeenth century, when William Smellie first saw the light of day in a small country village in Lanarkshire, it was then no mean feat for a mother to produce healthy infants or to survive the perils of childbirth with her functional and structural relationships intact. And should Nature appear to be making little effort to perpetuate the species, both mother and child were abandoned to the tender mercies of an ignorant midwife or a well-meaning medical practitioner. However, the next century was to see many profitable advances in the science and practice of medicine; and William Smellie, while struggling as a raw general practitioner in his native town of Lanark, showed a fearless independence of thought and action in working out his own great contribution to the modern science of obstetrics.

It would be difficult to find a writer more competent than Dr. R. W. Johnstone, Professor Emeritus of Midwifery in the University of Edinburgh, to assume the responsibility of giving an authoritative, complete and scholarly account of the circumstances which caused William Smellie to be hailed by a later generation as the master of British midwifery. And most practitioners of the art who are wise enough to study this excellent book are sure to derive pleasure from the masterly handling of the subject, the impeccable language of the text cast in a dignified style and the consistent adherence to strict chronological sequence, which makes for clarity and historical integrity.

It is a strange coincidence that Smellie was the eldest of four famous contemporaries born in the Scottish county of Lanarkshire. The others were William Hunter, William Cullen and John Hunter, of whom all were responsible for substantial progress in their respective branches of medical science. Other interesting references are made to Dr. Richard Mead, Tobias Smollett, whose literary gifts were fully utilized by Smellie, and Dr. Alexander Stuart, who was probably the first to perform original experiments with a nerve-muscle preparation. Amusing stories are related of the determined and often violent resistance openly displayed by disgruntled

midwives who took offence at the intrusion of a male practitioner on their cherished domestic preserves. And, needless to say, Smellie's common-sense approach to the teaching and practice of midwifery as convincingly set forth in his writings, evoked the bitter scorn and vituperation of many professional rivals.

Despite the constant disappointments, unyielding prejudices and irritating obstructions in his work as a leading man-midwife in London for nearly twenty years, he was eminently successful in his teaching, and converted many able doctors to the rationale of his new methods. His claim to ultimate fame is briefly summarized by Professor Johnstone in these words: "His seat among the immortals of medical history was won by the fact that his powers of thinking for himself—and of cutting through the stifling undergrowth of ancient authority and tradition, not to say superstition, in the process—enabled him as a teacher to mould the thought of his own generation to a degree that determined the course of the development of midwifery for all time."

The book itself is a credit to the publishers; it contains several good illustrations, and is fit to adorn the shelves of any medical library.

**Introduction to Dental Anatomy.** By James Henderson Scott, B.Sc., M.D., L.D.S., and Norman Barrington Bray Symons, M.Sc., B.D.S.; 1952. Edinburgh and London: E. and S. Livingstone, Limited. 9" x 6", pp. 300, with 172 illustrations. Price: 35s.

In the "Introduction to Dental Anatomy", by J. H. Scott and N. B. E. Symons, a considerable volume of data is well arranged and stated in a refreshingly brief manner. It covers development, growth and function of the teeth and jaws, a description of the structure and form of human teeth, with some notes on comparative types. There are insufficiencies, but the book is labelled an "Introduction". This useful and orderly selection and compilation of verifiable data has been relieved by the inclusion, here and there, of unusual opinions.

The following is from page 132: "As the teeth are more firmly attached to the mucous membrane of the mouth than to alveolar bone they are carried through the alveolar bone during the period of facial growth by the growing mucous membrane so that their sockets are being continually reconstructed around them."

On page 133 the following appears: "When the teeth are lost resorption of alveolar bone proceeds . . . until . . . in the upper jaw the floor of the sinus may be separated from the oral mucous membrane by a mere shell of bone. This resorption of the alveolar processes illustrates the inability of bone to resist direct pressure upon its surface unless it is covered, as in joints, by hyaline cartilage or, as in a functional dentition, the pressure is transmitted into tension along the fibres of the periodontal membrane."

Notwithstanding, the book is a useful text and reference for medical students and practitioners.

**Diseases of the Skin: A Manual for Students and Practitioners.** First compiled by the late Robert W. MacKenna, M.A., M.D., Ch.B. (Edin.); Fifth Edition, by Robert M. B. MacKenna, M.A., M.D. (Camb.), F.R.C.P. (London), with a chapter concerning radiology by I. G. Williams, F.R.C.S. (England), D.M.R.E. (Camb.), F.F.R. (Gt.B.); 1952. London: Baillière, Tindall and Cox. 9½" x 6½", pp. 622, with 215 illustrations. Price: 42s.

THIS edition of MacKenna's book, following fifteen years after the fourth, has been entirely recast. Although designed primarily for the general practitioner and the medical student, it will be regarded as an essential in a dermatologist's library.

All the common dermatoses are adequately covered as well as a number of the rarer ones. The disorders described in each chapter are well grouped. The descriptions and differential diagnoses are excellent and the lines of treatment sound and up to date, as exemplified by the description of the use of "Mepacrine" in the treatment of *lupus erythematosus*.

Considerable space has been given to syphilis and the latest combined penicillin, arsenic, bismuth course of therapy is clearly set out. The results of the war-time work of Mellanby on *Sarcoptes scabiei* are adopted, benzyl benzoate being the treatment of choice. The necessity for the disinfection of fomites with this therapy is no longer stringently required, a conclusion borne out by war-time experience of many dermatologists.

The paper and typography are both good. The black and white illustrations are well selected and uniformly excellent. The coloured plates are by no means so uniform in quality. Plate XIII illustrating *lupus erythematosus discoides* shows the erythematous areas in far too bright a shade of red. Plate XXI illustrating *lichen ruber planus*, however, very accurately gives the violaceous colour of this disease.

A full index is provided, the principal reference being given in thick type. Chance checking showed the index to be accurate.

**Cardiac Therapy.** By Harold J. Stewart, M.D.; 1952. New York: Paul B. Hoeber, Incorporated. 10" x 7", pp. 632, with 68 illustrations. Price: \$10.00.

THE planning of this work is based on an aetiological and physiological outline of the subject of discussion followed by a pharmacological and therapeutic discussion. This approach to therapy is admirable, but is obviously difficult, and the result in this book is not entirely satisfying.

The subject matter embraces a wide field of cardiology, but the discussion is disappointing in that entities such as essential hypertension and subacute bacterial endocarditis are considered relatively briefly. This fact is more pronounced in view of the detailed discussion of standard procedures, such as bed rest and its indications (in the first chapter) and relatively common drugs, constantly recurring throughout the book. Mention is made of new concepts of cardiology, but again a critical evaluation of newer procedures is lacking. Admittedly, as the author remarks, the place of such procedures in therapy is not finally determined, but subjects such as the resins, autonomic blocking agents *et cetera* deserve a more critical evaluation in works of this type.

The place of anticoagulants is discussed in myocardial infarction, and the author does not advise these agents in small infarctions and severe infarctions in the absence of arrhythmias and congestive failure, suggesting that they will be used in the event of development of these complications.

In the chapter on coronary artery disease and *angina pectoris* his opinion that "bed rest is occasionally advised" and the brief mention of heparin are at variance with newer concepts of this disease; similarly the advocacy of Smithwick's sympathectomy in essential hypertension is at variance with current opinion in this country. In general a critical evaluation of newer procedures in therapy is lacking.

The work is the subject matter of the author's experience and contains much useful information as to standard procedures. It is intended obviously as a work for students and general practitioners, and in this respect is recommended for its planned approach to therapy.

## Books Received.

[The mention of a book in this column does not imply that no review will appear in a subsequent issue.]

"A Handbook of Operative Surgery: Surgery of the Chest", by Julian Johnson, M.D., D.Sc. (Med.), and Charles K. Kirby, M.D.; 1952. Chicago: The Year Book Publishers, Incorporated. 8½" x 6", pp. 388, with 81 illustrations. Price: \$9.00.

Primarily an atlas of thoracic surgical operations, following accepted operative methods.

"Poliomyelitis", by W. Ritchie Russell, C.B.E., M.D. (Edin.), M.A. (Oxon.), F.R.C.P. (Edin.), F.R.C.P. (London); 1952. London: Edward Arnold and Company. 9" x 5½", pp. 90, with 20 illustrations. Price: 14s.

One of the chief purposes of the book is "to emphasize that the value of the various methods of handling paralysed muscles can be subjected to simple physiological tests".

"A Handbook of Radiotherapy for Senior and Post-Graduate Students", by Walter M. Levitt, M.D., F.R.C.P. (London), F.F.R., D.M.R.E. (Cambridge), of Lincoln's Inn, Barrister-at-Law; 1952. London: Harvey and Blythe, Limited. 9" x 5½", pp. 224, with 53 illustrations. Price: 30s.

The object of the book is to explain, in simple non-technical language, what are the radions used in therapy, how they are produced and applied, how they produce their effects, and so on.

## The Medical Journal of Australia

SATURDAY, FEBRUARY 21, 1953.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: surname of author, initials of author, year, full title of article, name of journal without abbreviation, volume, number of first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

### A WORLD CONFERENCE ON MEDICAL EDUCATION.

THE first world conference on medical education will be held at London on August 22 to 29, 1953. The conference will be held under the auspices of the World Medical Association in collaboration with the World Health Organization, the Council for Organization of Medical Sciences, and the International Association of Universities. The president will be Sir Lionel Whitby, Regius Professor of Physic in the University of Cambridge, and the deputy president will be Professor W. Melville Arnott of the University of Birmingham. Sir Henry Cohen, of the University of Liverpool, was to have been president, but he had to withdraw because of illness. It is expected that more than 500 representatives from medical schools, national and international medical associations and health organizations and leaders concerned with medical education everywhere will attend. The central theme of the conference will be standards of undergraduate medical education. International congresses of medicine have been held from time to time and these have dealt with several aspects of medical science; the ethical and the medico-political aspects of medicine have been discussed by the general assembly of the World Medical Association, by the World Health Organization, and by other bodies. This is the first occasion on which medical representatives from many nations have agreed to come together to discuss medical education. It will probably not be the last occasion. The plan of the conference includes two plenary sessions. The first, to be held at the outset, will deal with medical education and its relation to medical needs. At this session, regional viewpoints and the viewpoints of organizations will be presented as a general orientation for the conference. The second plenary session will be held at the end of the gathering and has as its subject: "Has Medical Education Kept Pace with the Rapid Development of

Medical Science?" At this session, the reports of sectional meetings will be presented. The sectional sessions are to be grouped under four headings. The first will deal with the requirements for entrants into medical studies and the selection of students. The second will deal with the aims and content of the medical curriculum. The third will deal with techniques and teaching methods in medical education, and the fourth with preventive and social medicine—its concepts and place in the medical curriculum. Each of these special sections will be under the chairmanship of a vice-president. The vice-presidents named are Dr. Victor Johnson of the Mayo Foundation; Sir Arcot Mudaliar, Vice-Chancellor of the University of Madras; Professor Alberto Hurtado of St. Mark's University at Lima, Peru; Dr. René Sand of the *Université libre de Brussels*. Already eminent persons from the fields of general education, medical education, and medical practice have been invited to speak. The languages of the conference will be English, French and Spanish and a simultaneous translation of speeches will be provided throughout the entire meeting. The general secretary of the conference will be Dr. Louis H. Bauer, Secretary-General of the World Medical Association; the local secretary will be Dr. E. Grey Turner, Assistant Secretary of the British Medical Association. This information has been sent to all member medical associations of the World Medical Association. It is hoped that a suitable delegation will be sent from Australia.

The *World Medical Association Bulletin* for October, 1952, is devoted almost entirely to this conference. All the contributions are published in English, French and Spanish. H. G. Weiskotten, Chairman of the Council on Medical Education and Hospitals of the American Medical Association, in a short contribution, points out that the details of the programmes of undergraduate medical education may differ greatly in different countries, but that the objective of all should be the same. Every medical student should acquire an understanding of the fundamental principles of the basic medical sciences and of their application in clinical medicine. He must also have training and experience in the major clinical fields of medicine if he is to approach his future work in an intelligent and scientific manner. The conference, Weiskotten holds, will provide an unusual opportunity, not only for an evaluation of various concepts, programmes and techniques, but also for the dissemination of new ideas. The conference is also, he thinks, of special importance on account of the unusual migration of practitioners at the present time, and because of the ever-increasing number who are seeking opportunities for advanced training in the different specialties in foreign countries. There is no doubt that he is right when he states that if these two groups are to be dealt with intelligently, it is essential that a clearer picture of what their basic training has been should be available. He also thinks that, as all education is essentially self-education, representatives of the various countries will have much to contribute and much to learn about the facilities, stimulus, supervision and guidance essential to successful self-education.

Dr. Hugh Clegg, editor of the *British Medical Journal*, makes an important contribution. He states that a sharing of experience should be of great value and that each country has much to learn from the others. He refers, on



the one hand, to the stress laid on technology of education in one country, and on the other to greater emphasis on clinical work and on the clinician in another country. A doctor in the first country will tend to think of the drug he gives in terms of absorption, blood level, and rate of excretion, and of its exact pharmacological or chemotherapeutic action. He will think, too, in terms of measurement, for science is measurement. In the second type of country, the doctor will think more in terms of treating diseases. Both attitudes, Dr. Clegg thinks, have their strength and their weakness and both are determined by education. In this regard, readers are referred to an important contribution by Professor Robert Platt in *The Lancet* of November 15, 1952, entitled: "Wisdom Is Not Enough—Reflections on the Art and Science of Medicine". This is an enormous subject and might well take up a great deal of the time of the conference. Another ill-defined subject, which Dr. Clegg would have discussed, is social medicine. It is, in his opinion, a subject of universal importance and especially in the underdeveloped countries where man is much at the mercy of an unhealthy environment. Dr. Clegg makes two further important points on which stress should be laid. He refers to Abraham Flexner's contention that the problems of medical education are the problems, not of medicine, but of education. "In this age of science and technology many are perturbed at the poverty of mind and lack of general education amongst science graduates—and graduates." A science student was asked in his final examination who Voltaire was. He replied that Voltaire was the man who invented the voltaic cell. One head can no longer hold all that is to be known. But, however scientific medicine is and will be, in its personal practice it must be applied by one human being to another. "The more complete a human being he is, the better for his patient will the practising doctor be." Doctors are, and should be, greatly concerned with the general education of the boy and girl in their formative years. Dr. Clegg reminds us that medicine has become so complex that the boy at school who thinks of being a doctor is being encouraged to specialize in chemistry, physics and biology before, or by the time, he is sixteen years old. The humanities become a closed book to him. Dr. Clegg, and many others no doubt, will look forward to hearing the views of schoolmasters on this educational dilemma when this conference takes place. We cannot doubt that, if schoolmasters are given the opportunity of expressing their views, they will make the most of it. The second point raised by Dr. Clegg is that if medical education is primarily a problem of education, what attempt have medical teachers made to learn anything about methods and techniques of teaching? We have pointed out in this journal on many occasions that the mere holding by a physician, surgeon, or specialist of a post at a teaching hospital does not necessarily make him a teacher. If the World Conference could persuade teaching hospitals that their medical teachers should know how to teach, the journeyings to and from this conference by medical representatives from every part of the world would be well worth while. We may conclude with Dr. Clegg's final sentence. The World Medical Association "has shown great vision in putting forward this project, because upon the principles and practice of medical education depend the health of the peoples of the world".

## Current Comment.

### THE MANCHESTER ROYAL INFIRMARY.

To mark the bi-centenary of the Manchester Royal Infirmary, Dr. William Brockbank has produced a thorough but restrained "Portrait of a Hospital".<sup>1</sup> The selection of material, the smooth sequence of the narrative and the unobtrusive presentation of extensive research bespeak the wealth of time and care expended in its preparation. The Australian reader will find much to interest him, and perhaps he will be struck by the number of incidents described which have a parallel in the history of our own hospitals—not, of course, that its builders showed a preference for rum rather than cash in return for their labours, but certainly in regard to many problems of medical progress and hospital administration.

The same pernicious system of election to the medical staff by subscribers forced one candidate to spend the sum of £690 on his campaign, a figure exceeded by the reputed cost to the famous J. G. Beaney, of Melbourne. The same caution concerning the activities of the surgeons was apparent, for a consultation of all members of the staff was demanded prior to any proposed operation; one motion—which failed—before the trustees was to the effect that it would be conducive to the welfare of the patients if the surgeons were "restricted from performing some of the great operations until they had attained a certain age or been elected a certain time". (The story behind this motion is not told: one wonders whether it concerns James Ainsworth, who, after serving in the infirmary as apprentice, clerk and apothecary successively, was elected a surgeon in 1806, at the age of twenty-three.) Erysipelas and surgical infection raised identical problems of hospital planning and construction, and the fact that the whitewash was scraped off the Manchester walls is a reminder of the colonial remark that the very bricks of the Melbourne Hospital were saturated with germs. When the "effluvia" and open closets began to contribute to the additional risk of contracting fever, it became necessary to defend the principle of hospitalization in both countries: the trustees of the Manchester Infirmary pointed out that while the amenities provided were not those of the homes of the rich, they were at least better than those of the poor. Matters as diverse as the public expression by the medical students of dissatisfaction with clinical instruction and the financial burden of providing the therapeutic amounts of alcoholic beverages prescribed by the medical staff each have their colonial counterparts.

The preceding comments spring not from a parochial desire to effect comparisons, but from the wish to emphasize the observation that histories of such institutions are bound to cover a good deal of common ground. The medical problems are essentially similar (although in this connexion it may be noted that the smaller Australian field particularly lends itself to more detailed study than is usually feasible) while the administrative problems are directly related to changes in the social and economic fabric of the community. To have more than local appeal the history of a hospital must aim to define its character (what Robert Scot Skirving calls the soul of a hospital), "to mingle light and shade", to give it independent life. Such an objective is implicit in Dr. Brockbank's choice of the word "portrait" in his title. That he has succeeded is a matter for congratulation and perhaps for some surprise in view of his rigid adherence to the principle that the text should not be encumbered by undue reference to personalities. Thus, Charles White, the distinguished man-midwife and one of the infirmary's first surgeons, is the only medical man of whose life and work there is adequate account. John Ferriar is there for his work on hygiene, but not as the erudite commentator on "Tristram Shandy" or the author of "Bibliomania". The association with the infirmary of

<sup>1</sup> "Portrait of a Hospital, 1752-1948: To Commemorate the Bi-Centenary of the Royal Infirmary, Manchester", by William Brockbank, 1952. London: William Heinemann (Medical Books), Limited. 9½" x 7", pp. 228, with 54 illustrations. Price: 25s.

men such as Ainsworth and Joseph Jordan, who was largely responsible for the emancipation of provincial medical education in England (in the course of which he was fined £20 for his part in a body-snatching episode) must have gone a long way to found a worthy tradition; but of the former we find no mention and of the latter merely the circumstances surrounding his election. Admittedly some recapitulation would have been necessary, for in 1904 Dr. E. M. Brockbank published "Sketches of the Lives and Work of the Honorary Medical Staff of the Manchester Infirmary".

Dr. Brockbank's work achieves the status of portraiture notably by virtue of two outstanding chapters. The first is "The Case of the Absconding Secretary", which would appear to refute Somerset Maugham's dictum that fact is a poor storyteller. There is none of the haphazard beginning or ineffectual conclusion which Mr. Maugham associates with fact: recorded simply but forcefully in the form of abstracts from the minutes, the chapter is a tribute to nineteenth century secretarial prose. The second is the chapter describing the infirmary's activities during the 1939-1945 war. Indeed there is character in an institution which, in 1942, with the German and Japanese armies advancing on every front, calmly requested the local Town Planning Authority to reserve a site for a proposed new hospital, and which organized practice bombing incidents "to keep the staff in fighting trim" in view of the comparative quiet after the damaging raids of 1940-1941.

Manchester may be considered fortunate to have had one such enthusiastic historian as Dr. E. M. Brockbank; that his son should prove so excellent a successor is a tribute to "the Spirit of the Place", something of which he has managed to convey to us in his "Portrait".

#### THE MEGALOBlastic ANÆMIAS IN RETROSPECT.

THE story of pernicious anæmia is one of the most dramatic in medicine. Described by Addison in 1855, pernicious anæmia took its place in text-books of medicine as a clear-cut entity, unfortunately incurable and ultimately fatal. For many years the picture remained essentially unchanged, so that Osler,<sup>1</sup> in 1918, wrote that the description given by Addison presented the chief features of the disease in a masterly way, and for the instruction of medical students quoted the following passage from it:

It makes its approach in so slow and insidious a manner that the patient can hardly fix a date to the earliest feeling of that languor which is shortly to become so extreme. The countenance gets pale, the whites of the eyes become pearly, the general frame flabby rather than wasted, the pulse perhaps large but remarkably soft and compressible. . . . There is an increasing indisposition to exertion, with an uncomfortable feeling of faintness or breathlessness in attempting it. . . . the debility becomes extreme—the patient can no longer rise from bed; the mind occasionally wanders; he falls into a prostrate and half-torpid state and at length expires; nevertheless, to the very last and after a sickness of several months' duration, the bulkiness of the general frame and the amount of obesity often present a most striking contrast to the failure and exhaustion observable in every other respect.

This is certainly not the picture of pernicious anæmia as we know it today. Those of us who remember the medical wards of twenty-five years ago will, however, readily recognize the portrait Addison painted and will recall the faces and the names of many patients with the lemon yellow colour and placid expression of pernicious anæmia. The chronicity of the disease and its tendency to remission and relapse meant that these patients spent long periods in hospital, sometimes reappearing, after a remission, with jaundice and vomiting caused by arsenic, dosage with which was the principal form of treatment.

In an article entitled "Thirty Years' Experience of the Megaloblastic Anæmias", L. S. P. Davidson<sup>2</sup> writes that

his experience of hæmatology falls naturally into three periods. The first of these covers his work in Edinburgh during the years 1919 to 1929, the second his occupancy of the Regius Chair of Medicine in Aberdeen from 1930 to 1938, and the third his term of office as Professor of Medicine in the University of Edinburgh. During the first period, until 1926, when the discovery of liver therapy was announced, Davidson, working in Professor Gulland's wards, watched many cases of pernicious anæmia until they reached their fatal termination. Classical pernicious anæmia as seen in those days is a rarity today. According to Davidson, failure to realize that many clinical features once held to be of great diagnostic value are rarely seen today is a potent cause of delay in diagnosis and in the institution of proper treatment. Descriptions of the disease in many textbooks of medicine in use today are still based on the classical picture, seen before the introduction of liver therapy. Dr. Newall, one of Dr. Davidson's assistants, has examined the case records of a consecutive series of 135 sufferers from pernicious anæmia seen at Dr. Davidson's blood clinic during the years 1944 to 1948, and compared the clinical features with those described in the literature prior to 1925. From this work it appears that the picture of the disease, so frequently seen prior to the introduction of liver therapy, as indicated by clinical jaundice, acute glossitis, diarrhoea, ataxia and splenomegaly, can no longer be accepted as satisfactory if early diagnosis is to be made and adequate treatment instituted before the development of serious complications. Davidson writes:

The main presenting features seen in cases of pernicious anæmia at the present time are weakness, dyspnoea on effort, vague dyspepsia, pallor of the skin and especially of the mucous membranes. It should be stressed in text-books of medicine that the diagnosis of pernicious anæmia cannot be made solely by physical examination or on the presenting features of the disease since these are not pathognomonic of any particular type of anæmia. A competent hæmatological examination is the only method which will enable the correct diagnosis to be made.

Addisonian pernicious anæmia is by far the commonest type of megaloblastic anæmia in Scotland. Of the other types, Davidson singles out the megaloblastic anæmia of pregnancy for special discussion. He points out that it is, of course, a rare disease, and stresses the fact that it is refractory to the parenteral injection of liver extract or vitamin B<sub>12</sub>, but responds immediately to the oral ingestion of proteolysed liver or folic acid.

In similarly retrospective vein, W. P. Murphy,<sup>3</sup> of Boston, has written of his twenty-five years' experience in treatment and management of pernicious anæmia. He states that the final chapter in the history of pernicious anæmia has yet to be written, though it is, he hopes, well started, for it is now possible to prevent pernicious anæmia if its development is anticipated and the proper preventive therapy is instituted. The well-known familial incidence of the malady should make it possible to anticipate it in many instances. In this field, as in all others, the aim of modern medicine should be the dynamic one of prevention rather than the static acceptance of that fatalistic name, pernicious anæmia. It is true that the disease has lost its terror; it is no longer pernicious, it is diagnosed at an earlier stage and can be treated efficiently. On the other hand it is still very much with us, and vast quantities of liver extract in various forms and nowadays of vitamin B<sub>12</sub> are used in its treatment. While vitamin B<sub>12</sub> is probably the treatment of choice in true Addisonian anæmia, some patients appear to benefit more from the earlier form of treatment with some variety of liver extract. It is true that in some instances this therapy is used unnecessarily in the treatment of secondary anæmia and used without adequate laboratory control. Even allowing for this, does not the widespread use of these substances in medicine mean that macrocytic anæmia in some form or other is more common than it should be? This is not a state of affairs to be accepted with complacency. As Murphy says, the final chapter in the story of pernicious anæmia is yet to be written and there is still some hard thinking to be done before it can be completed.

<sup>1</sup> Osler, William (1918), "A Textbook of Medicine".

<sup>2</sup> *Edin. Med. J.*, July, 1952.

<sup>3</sup> *J.A.M.A.*, July 5, 1952.

## Abstracts from Medical Literature.

### OPHTHALMOLOGY.

#### Retinal Detachment Cataract and Neurodermatitis.

R. S. COLES AND J. LAVAL (*Arch. Ophthalm.*, July, 1952) give an historical review of cataract and neurodermatitis. They report on a patient with neurodermatitis who had bilateral cataracts, which were removed with subsequent massive retinal detachment. Reviewing the literature, the authors can find 63 such eyes operated upon with retinal detachment in 23 eyes, a staggering proportion of 36%. They believe that the cause of the high percentage of retinal detachment in this type of cataract is to be found in the fact that in these eyes the vitreous is unhealthy. They consider that only the most conservative surgery should be practised; in patients under the age of thirty years, provided there is a good chance of lens absorption, needling followed by linear extraction should be performed. In others extracapsular extraction, which causes less disruption of the vitreous than intracapsular extraction, should be performed.

#### Traumatic Hyphæma.

P. THYGESEN AND C. BEARD (*Am. J. Ophthalm.*, July, 1952) report on 34 cases of traumatic hyphæma. In five of these cases the final vision was only perception of light or less and in two cases enucleation was required. The authors state that the most important complication of traumatic hyphæma is glaucoma, and next in importance is blood-staining of the cornea, which occurs as a rule only if glaucoma is present. They consider that ciliary body injury best explains the serious nature of hæmorrhage following contusion. For this reason contraction of the ciliary body should be avoided as much as possible during the first five days after the contusion. Secondary hæmorrhage occurred in 13 of the 34 cases. The authors state that when secondary hæmorrhage does occur, the prognosis, which before was favourable, now becomes bad; and if in addition the tension is raised, the prognosis takes a further turn for the worse. They recommend routine treatment as follows: treatment in hospital with complete bed rest, instillation of 5% homatropine drops in the injured eye four or five times daily, administration of rutin (60 milligrammes) and vitamin C (300 milligrammes) three times daily, and sedation. When secondary hæmorrhage occurs a strong miotic should be used, and if the hæmorrhage fills the entire anterior chamber immediate paracentesis is indicated.

#### Polymyxin E.

D. AINSLIE AND CHARLES SMITH (*Brit. J. Ophthalm.*, July, 1952) report on the penetration of polymyxin into the eye and its therapeutic value in experimental infections due to *Pseudomonas pyocyanea*. They state that polymyxin E is a white crystalline powder highly soluble in water. It is suitable for subconjunctival injection, and is best given with "Mydracaine" as the solvent. In the rabbit subconjunctival injection of 250,000 units of polymyxin led to

therapeutic levels in the cornea, aqueous and vitreous after one hour. Intracorneal injection of *Ps. pyocyanea* failed to produce infection in 14 rabbits when polymyxin E was given subconjunctivally immediately after the infecting dose; and of 20 animals with experimental *Ps. pyocyanea* ulcers, the infection was overcome in 19 by subconjunctival injection of polymyxin E.

#### Dacryocystorhinostomy by Intubation.

W. HEDLEY SUMMERSKILL (*Brit. J. Ophthalm.*, May, 1952) describes his technique for dacryocystorhinostomy in which he uses a polythene tube which passes from the sac through the lacrimal bone into the middle meatus. The operation is indicated for dacryocystitis due to any form of simple obstruction of the naso-lacrimal duct which cannot be resolved by more conservative measures. The operation requires no special technique, and little post-operative treatment is required. The patient is kept in hospital for twenty-four hours. Permanent retention of the polythene tube produces no tissue intolerance.

#### Radium and Deep X-Ray Therapy for Retinoblastoma.

H. B. STALLARD (*Brit. J. Ophthalm.*, June, 1952) discusses the problems of radium versus deep X-ray therapy in the treatment of retinoblastoma. His observations and conclusions are based on five series of patients: his own, patients treated at Christie Hospital and Holt Radium Institute, Manchester, Reese's series and Windeyer's series. The author is of the opinion that treatment by means of radium disks is better than that with radon seeds and that this form of therapy is preferable to deep X-ray therapy. With the latter there are great technical difficulties, namely, difficulty in directing the dose to the neoplasm without affecting other tissue, and the protracted treatment. If one-third or less of the retina is involved in retinoblastoma, there is reasonable hope that the tumour may be destroyed by irradiation. In advanced cases, that is, with more than half the retina involved, it is advisable to excise the eye with a long length of optic nerve and to give post-operative irradiation to the orbit.

#### Cytology of Allergic Conjunctivitis.

J. A. HANSER *et alii* (*Arch. Ophthalm.*, June, 1952) present their findings from examination of 572 conjunctival smears. In each case a complete allergic history was taken. Cases were selected in which no specific causative agent was found and examination of the conjunctival smear showed a high eosinophilic count. Patients who had an average of 3% to 10% of eosinophiles in the smear were treated, and the results were analysed. Methods of treatment included the use of "Zephiran", "Metaphen", "Antistine", "Histadyl", "Pyribenzamine", "Benedryl", "Chlor-trimeton", dust injections, dust and mould injections, cortisone applied locally, cortisone administered orally, cortisone injected intramuscularly and ACTH injected intramuscularly. It was found that cortisone administered locally or systemically produced a greater decrease in eosinophil count from the conjunctival smear and gave better subjective

improvement than other agents used. *Staphylococcus toxoid* given hypodermically was the next most effective agent.

#### Detection of Intraocular Tumours with Radioactive Phosphorus.

CHARLES I. THOMAS *et alii* (*Arch. Ophthalm.*, March, 1952) write a preliminary report on the use of radioactive phosphorus to diagnose intraocular tumours. After intravenous injection of  $P^{32}$  a small Geiger counter is held in contact with the sclera, directly over the area of the suspected tumour. The count is repeated one hour and one and a half hours after injection of the isotope. Similar counts are made over other areas of both eyes. The authors report the use of the technique in eight cases, six of the patients having intraocular newgrowth.

### OTO-RHINO-LARYNGOLOGY.

#### Patulous Eustachian Tube.

P. M. MOORE AND J. B. MILLER (*Arch. Otolaryng.*, December, 1951) state that the condition of patulous Eustachian tube is more prevalent than is usually supposed. The patients are often much disturbed by their symptoms, which include a roaring in the ears synchronous with breathing and pronounced autophony. The symptoms are made worse by exercise. Auditory acuity is affected very little, so that the audiogram is likely to be normal. The Eustachian tube is found to admit air very readily, and the patient may obtain temporary relief by a forceful sharp inspiration through the nose. The condition may develop in the generalized emaciation of serious diseases, it being thought that absorption of the fat layer around the Eustachian tube may occur. Scar tissue around the tube may cause undue patency. The upward pressure of a high-domed hypertrophied tonsil on the *levator palati* muscle has been thought to cause the pharyngeal orifice of the Eustachian tube to remain open. The symptoms have been reported following retrogasserian neurectomy resulting in complete or partial paralysis of the *tensor veli palatini* muscle. Infiltration of paraffin around the Eustachian tube orifice, applications of nitric acid and phenol, and the electro-cautery have been tried. The authors used insufflations of salicylic acid and boric acid powder (1:4) through a Eustachian catheter. They state that instant and dramatic relief may result from this treatment, although it may have to be repeated many times. A review of twelve cases is presented.

#### Maxillary Sinusitis and Local Injection of Procaine Penicillin in Oil.

M. S. STRONG AND R. W. TONKIN (*J. Laryng. & Otol.*, December, 1951) report the treatment of maxillary sinusitis by local injection of procaine penicillin in oil. The preparation used was a sterile suspension of procaine penicillin G in arachis oil. Each millilitre contained 300,000 units of penicillin G chemically combined with 120 milligrammes of procaine. The oily suspension was chosen, as penicillin so suspended is



more slowly hydrolysed than in an aqueous suspension. Owing to the bulk of the instillation, the viscosity of the oil and the relatively large size of the particles the instillate remains in the antrum, and with considerable penicillin concentration, for a minimum of five days, or for longer periods if infection is not overcome, for in such cases inflammatory exudate delays the ciliary expulsion of the instillate. The absorption of penicillin from the antral mucosa into the blood-stream was proved by blood assays, so that it was concluded that sites of infection in the depths of the mucosa should be reached. However, it is suggested that in cases of long-standing chronic sinusitis, hyperplasia and stratification of surface epithelium may prevent this absorption. Experimental tests after the method of Proetz indicated relatively well-maintained ciliary activity in specimens of mucosa exposed to the procaine penicillin in oil suspension. The routine of local treatment included a preliminary irrigation of the antrum followed by the instillation of one millilitre of the procaine penicillin in oil. This was repeated at intervals of five to seven days until the returning fluid was clear. A series of 25 subjects of proven infection were treated. An average of 2.4 treatments was required to effect cure, whereas in a control group four treatments were required to effect cure. There were no undesirable local or general effects. The authors state that the treatment seems worthy of use in cases of subacute and early chronic infection of the maxillary sinus. In long-standing cases with irreversible changes in the mucosa such conservative measures are less likely to be effective.

#### Congenital Atresia of the Auditory Canal.

DE GRAAF WOODMAN (*Arch. Otolaryng.*, February, 1952) states that a man, aged twenty-nine years, had deformed and contorted auricles without evidence of an external canal on either side. He had had poor hearing since birth. Both mastoid bones had fair pneumatization. Audiograms showed excellent bone conduction for both ears. The air conduction tests presented a curve showing a loss of 50 to 60 decibels. At the first operation mastoidectomy was performed through an endaural incision. There was no evidence of an external auditory canal. After the mastoid cells had been entered at the tip, extenteration was carried up to the dural plate and thence forward until the middle ear cavity was located. An atrophic incus and a deformed malleus were found and were removed. A large, well-formed, mobile stapes was seen. The external semicircular canal was identified and well skeletonized. The entire mastoid cavity was enlarged in such a manner as to make it funnel-shaped, so that there was no overhang at any edge. A skin graft, removed from the abdomen, was cut into six pieces and used to line the depth of the cavity and its walls, these being held in place with paraffin gauze and melted paraffin. At the end of six days the paraffin mould was removed, and a duplicate acrylic mould was made. This was then used for about two weeks. At first there was much hearing improvement. However, this soon lapsed to a level about 15 decibels

better than before operation and was still at this level after four months, when fenestration of the external semicircular canal was performed, after elevation of a flap of the covering dermo-periosteum. Final audiograms show a gain of 35 decibels in the speech-hearing range. The criterion of whether to perform fenestration or not depends upon whether or not a mobile stapes is found. If the stapes is found to be mobile, a good result may be expected without fenestration; although the placing of a skin graft may lead to stapes fixation, so that the hearing may decrease a few months later. In such event fenestration should follow.

#### Otosclerosis: A Closed Method of Fenestration.

PHILIP GARSON (*J. Laryng. & Otol.*, February, 1952) describes an operation on patients with otosclerosis through a post-aural incision, with exposure of the external semicircular canal through an extensive atticotomy. He explains that in this operation the ossicles, though brought to view, need not be interfered with, although removal of the incus may make the operation quicker and easier. A free conjunctival graft is used to cover the fenestra, this being held in place for seven days under a gold-leaf covering and gauze packing. After one week the wound is closed, and when the stitches have been removed the patient is ready for discharge from hospital. The method means that the time occupied for treatment is much reduced, a total of fourteen to twenty-one days only being needed before healing is complete; the patient is then able to resume normal life. The risk of a moist ear following the operation is almost negligible. The use of pentamethonium bromide to lower blood pressure and thus to render the field bloodless is of great assistance to the surgeon. In an early group of cases clinically satisfactory hearing was obtained in 50% of the cases. In the later group, in which more careful selection of cases was followed, improvement in the 512 to 2048 cycle range has averaged about 25 decibels, although there were four failures in 16 cases.

#### Innervation of the Cochlea.

ETTORE BOCA (*Arch. Otolaryng.*, February, 1952) has examined the inner ear of rat fetuses at different stages of development in serial sections, staining according to the method of Cajal. He states that the existence of vestibulo-cochlear anastomosis has been confirmed, and the existence of two systems of nerve fibres in the *lamina spiralis* has been clearly demonstrated. One is radially arranged and has its origin in the cells of the spiral ganglion. The other is spirally arranged and is independent of the ganglion. It is presumed that the spiral system is derived from the vestibular ganglion and is distributed to the walls of the cochlear duct. Some of these fibres may be vegetative in character, but their staining properties are not like those of the autonomic nervous system. The radial system of fibres is characterized by great regularity of disposition and appears to be associated with the spiral ganglion and with the organ of Corti. The demonstration of two systems of fibres supplying the

cochlea raises the problem of dual cochlear innervation, one for tone and one for noise perception, or perhaps two phylogenetically different sensorial systems, one, the younger or more differentiated, serving frequency analysis and the other, the older and less differentiated, serving the less specific function, the quasitactile "spatial" character of sound.

#### Nuclear Jaundice and Deafness.

JOHN GERRARD (*J. Laryng. & Otol.*, January, 1952) states that out of a series of 360 deaf children in Birmingham schools for the deaf 33 were stated to have been jaundiced in infancy. The incidence of deafness in children with kernicterus has been claimed by various observers as 20% to 80% of cases. The incidence may be greater than has been thought, for of 24 children examined who had neurological sequelae to Rh iso-immunization and who had been subject to full audiometric examination, 22 had perceptive deafness, one had conductive deafness and one only had a normal range of hearing. Although kernicterus commonly occurs in association with Rh incompatibility, it may occur independently and is then associated with prematurity. In either instance the neuropathology is identical, and lesions of the cochlear nuclei in the medulla are common. The author has been able to examine the cochlea and the cerebral auditory cell stations in two cases of kernicterus in which death occurred during the neonatal period. Serial sections revealed no abnormality in the organ of Corti or in the spiral ganglion. Extensive destruction of the nerve cells was found in the dorsal and ventral cochlear nuclei of the medulla. In one case sections were taken also through the inferior colliculus, the medial geniculate body and the temporal cortex. The nerve cells in these regions were essentially normal.

#### Glomus Jugulare Tumour of Middle Ear.

SAMUEL ROSEN (*Ann. Otol., Rhin. & Laryng.*, June, 1952) reports three cases of glomus tumour of the middle ear. In each the drum was intact. The patients complained of constant, severe, low-pitched roaring tinnitus and high-pitched swishing tinnitus in the affected ear. Some spasms of pain were reported in the ear and hemi-crania on the same side. Hearing was slightly depressed. Through the drum a reddish-purple, sharply circumscribed mass could be seen extending upwards from the tympanic floor. For biopsy an incision was made through the skin of the bony canal wall from three to nine o'clock, about five to seven millimetres external to the drum. The incised skin was then separated from the bone as far as the tympanic membrane, which was then lifted out of its sulcus and reflected upwards; the lower half of the tympanic cavity was thus exposed. A specimen of tissue was easily punched out of the tumour with little bleeding. The report was of a non-chromaffin paraganglioma of the tympanum. The tumour was later removed in one case through a radical mastoidectomy opening. The bony floor of the tympanic cavity was intact. The tumour arose from the promontory and had not spread to bone. Removal was without difficulty, and little bleeding occurred.

## Special Articles for the Clinician.

(CONTRIBUTED BY REQUEST.)

### LIII.

#### THE USE AND ABUSE OF COSMETICS.

THE beginnings of cosmetology can hardly be less ancient than the beginnings of medicine, for skin blemishes obtrude themselves on the attention in a most obvious way. The amount of space given to grey hair and baldness in the Ebers Papyrus indicates not only that they are not afflictions peculiar to modern man, but that there were the same frenzied and fruitless efforts to escape them as there are today. Remedies are to be found for the removal of moles and to prevent them; to keep away and to banish wrinkles; to give colour to the skin; to prevent hair from falling; to cure baldness; to prevent greyness and to dye hair.

Most of the Egyptian remedies were amazing concoctions, many of them containing nauseous and disgusting animal substances to drive away the demons (scatological); but we also find calamine, sulphur, wax, balsam, honey, sea-salt *et cetera*. Their use was haphazard, and they had no specific purpose, treatment being more by magic than by the intelligent use of remedies.

Over the centuries the study of cosmetics has become a more exact science, until today we find large firms which maintain permanent research laboratories, constantly improving their many products.

"Cosmetic" comes from the Greek and means to improve beauty.

"Cosmetics" are preparations for beautifying the skin, hair or nails. They may be used either to enhance or to disguise nature.

They can enhance nature by preventing wrinkles *et cetera*, by supplying something missing (for example, colour) or by stressing an attractive feature already present.

They can disguise nature by concealing an unsightly feature, as in the hiding of birth-marks, moles *et cetera* by "Coverspot" and powder applications. It must be remembered that cosmetics, used in this way, deceive but do not cure.

Unless they are used with care and discretion in each instance they distort nature. Used appropriately they are invaluable to individual morale and also can give an æsthetic atmosphere. Whilst denying that beauty can be found in a bottle or jar, we must admit that the ravages of water, wind and sun can be modified by the judicious use of emollient creams *et cetera*.

To some extent the skin reflects the condition of the mind and body. How often is a horse or dog judged fit for a race merely on the sleekness and gloss of his skin?

#### Importance of Film and Fashion.

The use of cosmetics by women is to impress or attract the opposite sex, to give self-confidence and poise to the wearer and to impress other women. Advertising and the films stress the importance of cosmetics, establish fashions and stimulate interest in certain styles.

Take, for example, the "slip" of different coloured hair at present so frequently seen, or the extension of the canthi to give an oriental appearance. These and similar follies can be classified under the heading fashionable but foolish.

#### The Scalp Hair.

The hair, always important and regarded as woman's crowning glory, has been in all ages the subject of much attention. In these days, when hats are comparatively rarely worn, it is of even more importance. Various styles of haircut are adopted to suit faces, moods and mannerisms. Its care and hygiene are largely left to the hairdresser, opportunity and time for these apparently not being possessed by the individual.

There is no doubt that some of the styles are very becoming. But here lies the rub. The hair should be shiny and well groomed and the scalp clean. Unfortunately, many of the "hair-dos" preclude even ordinary hygiene and cleanliness. Rather than lose the "waves" the woman forgoes soap and water.

"Permanent" waves are made either by the hot or the cold method. The hot method can be electric or non-electric, and its only risk is a thermal burn. The cold wave involves the use of chemicals which may cause contact dermatitis.

Hairwaving is as old as mankind; only the methods of producing the wave have changed, and all methods depend on the basic principles of preformation and sulphur loss to effect the wave. Alkaline hydrolysing agents are commonly used to help produce sulphur and ammonia loss, while preformation depends on curlers or other mechanical appliances.

Until about 1938 heat was always used, either in electric curlers or in devices employing chemicals which gave heat by an exothermic reaction. About this time some attempts were made to use solutions which did not require the application of heat. These solutions were the forebears of what today we call the "cold wave". At first they contained toxic and unstable substances such as ammonium sulphide. With the discovery of the thioglycolates, however, these toxic substances disappeared from use, and the solutions used at present are free from danger.

Dyeing of hair is often carried out for economic reasons, women with greying hair apparently not being wanted for secretarial or office work. Whether this is real or only imaginary I am not prepared to say. The most efficient dye for grey hair contains paraphenylenediamine, which is not a chemical irritant, but some users eventually become sensitized to it and get dermatitis. Other dyes are apparently the result of fashion trends or the influence of the films. Tinting of hair for individual caprice by hydrogen peroxide, blue rinse *et cetera* is generally of an ephemeral nature and seldom does harm.

#### The Nails.

Paronychia is commonly due to over-care of the nails. Many women force back the eponychium daily and thus permit germ-laden fluids, such as washing-up water, to penetrate deeply into the nail-fold.

Other people pry beneath the nail plate, and it was the writer's experience recently to see a case of osteomyelitis of the terminal phalanx caused in this way.

Nail polishes and removers are uncommon causes of dermatitis when one considers that their use is almost universal among the fair sex.

Many deformities and dystrophies of the nails are exceedingly recalcitrant to treatment and, in addition, are difficult to hide by cosmetics. The aetiology of these dystrophies is largely unknown, although many are found in association with debility or systemic disease.

Other disorders of the nails, such as the pitting of psoriasis, kollynychia, and fungous infections, are well known but very difficult to cure. Many nail abnormalities are lessened by superficial X-radiation, although the rationale of this treatment is obscure.

#### Eyebrows.

Plucking is performed when the individual considers she has an excess of eyebrow hair. This operation is probably not harmful if only a few stray hairs are epilated, but when all are removed except a pencil line, the skin becomes coarse and discoloured from frequent bruising and small hemorrhages, and after years of such maltreatment bluish pigmentation may occur. When eyebrows are considered too sparse, pencilling is used. This does no harm locally, though it could, and sometimes does, mask a thyroid deficiency.

#### Eyelashes.

The coarse hairs of the eyelashes apparently have an attraction, and they are accentuated with paint and stroked upwards to give them that "come hither" look.

#### Eyes.

Drops are used to brighten and liquefy the conjunctivæ, giving the "sultry" look of certain film stars.

#### Hirsuties.

Excess facial and/or body hair is a fairly common complaint among women. In general this condition is of idiopathic or familial origin, although at times it may be found in association with endocrine tumours or abnormalities. The relationship of the facial and general body hair to the hormonal balance is poorly understood.

Excess hairs are best ignored. Otherwise they may be bleached or, if not too numerous, removed individually by electrolysis. Other methods of removal, such as waxes and shaving, are accused by many people of coarsening the skin and the hair.

The use of thallium, given either internally or externally, to cause epilation is to be condemned. Permanent epilation by radiotherapy should not be performed, as the dose required

may give rise to telangiectases and atrophic changes many years later. Of course temporary epilation of the scalp as practised for *tinea capitis* or of the beard in *syccosis barbae* is free of this risk.

#### Vitamins and Hormones in Cosmetics.

Of recent years numerous products containing vitamins and hormones have appeared on the market, and extravagant claims have been made for their efficacy. Those containing vitamins have no effect. On the other hand, hormones may be readily absorbed through the skin from local applications and subsequently exert their normal systemic action. There is no real evidence that they benefit the skin to which they are applied, but there is the possibility that, if used too freely, they may exert a noticeable and perhaps deleterious effect on other organs.

#### Common Abuses of Cosmetics.

The application of creams, oils or greasy preparations to already greasy skins may produce comedones and pustules or aggravate an existing acne. Conversely, the over-use of soap and water on a dry skin lacking in natural fat produces an even drier, scaly skin predisposing to chafing and eczematous eruptions.

Unskilful interference with moles and skin growths by non-medical persons is a well-known danger. Through maltreatment scarring may be produced that is worse cosmetically than the original lesion, and there is always the risk of stimulating a malignant melanoma.

Advertising often establishes false claims for sun-protection creams. The trustful acceptance of these claims may give rise to severe burning.

The antigenic potential of substances used in cosmetics is a greatly variable factor. Fortunately, most new cosmetic preparations are skin-tested on large numbers of individuals before being placed on the market and, as a result, contact dermatitis is not common. The applications most likely to cause trouble are hair varnishes, depilatories and antiperspirants.

Finally, we must consider those instances in which women infringe the commonly accepted laws of æstheticism. It is not always sensible or attractive for a person, otherwise bucolic, to adopt the sloe eye and "hair-do" of the oriental or the brazen features of the Jezebel. Yet this foolish tampering with natural features is seen every day, the abuse in this case being not so much against the subject as against the unfortunate observer, who, after all, deserves some mention in a discussion on cosmetics.

J. WITTON FLYNN,  
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## British Medical Association News.

### SCIENTIFIC.

A MEETING of the Victorian Branch of the British Medical Association was held on June 18, 1952, at Saint Vincent's Hospital, Melbourne. The meeting took the form of a number of clinical demonstrations by the members of the honorary medical and surgical staff of the hospital.

#### Myxœdema.

DR. JOHN HAYDEN showed a male patient, aged forty years, with myxœdema. He pointed out that in his experience the diseases in which the correct diagnosis was most frequently missed were myxœdema, gout and emphysema. Myxœdema had to be differentiated particularly from chronic nephritis, anæmia, cerebral arteriosclerosis and fibrositis or arthritis. The patient presented had complained of diffuse aching pains, especially pronounced over the shoulder region, and of increasing obesity. Dr. Hayden pointed out that diffuse pain was a frequent symptom and headache, often unilateral, was not uncommon. The change in voice progressing to dysarthria was a diagnostic symptom. Not all the classical signs described in text-books needed to be present before a diagnosis was made, and the patient presented, despite obvious signs of myxœdema, had an exceptionally good growth of eyebrows. Dr. Hayden pointed out that the majority of patients with myxœdema were females, and a large proportion were patients who previously had had their thyroid glands removed for toxic or non-toxic goitre. He wondered whether in recent decades the surgeons

had not become too radical in their extirpation of the gland. He said that the greatest hurdle to the correct diagnosis of myxœdema was that doctors rarely thought of the condition in differential diagnosis.

#### Pernicious Anæmia.

Dr. Hayden's second patient was a male suffering from pernicious anæmia, who had previously had mild attacks of gout in his great toe. On treatment with vitamin B<sub>12</sub> his blood count made a rapid response and his leucocyte count doubled. In the second week of treatment he developed acute gout in his wrists and knees. Dr. Hayden said that no liver extract, which was reputed to be a precipitating factor in the production of gout, had been used, and he attributed the acute exacerbation to the increased formation of white cells. He pointed out that he had seen four patients with undiagnosed gout in consulting practice in the past year, and that the main cause of error was that it was not well recognized that polyarticular gout might occur without involvement of the great toe, tophi, increased blood uric acid content or radiological evidence. In most cases it was only the later stages in which tophi occurred. The text-books frequently stated that the skin over the swollen joints was red and shiny. That was true of the great toe, but rarely so of other joints, which might be considerably swollen and yet the skin might be relatively pale. Gout could be a febrile disease with high temperature readings and pronounced leucocytosis. Dr. Hayden described a patient with polyarticular gout with a temperature of 102° F. and a leucocytosis of 20,000 per cubic millimetre. That man had been in hospital in three successive years for periods ranging from six weeks to three months, had undergone numerous investigations and had slowly recovered. When he was given colchicine his fever and signs promptly subsided, and he had been free of symptoms for fourteen months.

Dr. Hayden said that the diagnosis of gout should be suggested by the suddenness of onset of pain and swelling, by the severity of the pain without any evidence of pyogenic infection or rheumatic fever, and by the complete restoration to normal of the joints between the attacks except in the later and obvious stages of the disease.

#### Hypertension.

Dr. Hayden also showed a patient suffering from hypertension who had been treated by sympathectomy with complete relief of headache, but in whom the blood pressure had returned to the pre-operative level. Hexamethonium produced a fall, but because of evidence of cerebral arteriosclerosis it was thought that no good purpose could be achieved by great reduction of pressure.

Dr. Hayden also showed charts of patients treated with hexamethonium, and said that he believed it was useful in treatment, especially for patients with commencing failure of the left side of the heart. In only a small percentage was the drug effective when given by mouth, and its effects were erratic. The subcutaneous method of administration was the method of choice, but as the injections had to be given three times a day, only patients who had serious symptoms should be submitted to the therapy. If renal function was much impaired, the drug should be used with the greatest care, as uræmia might be precipitated. Patients varied tremendously in their reaction to hexamethonium, and the initial subcutaneous dose should not be more than 15 milligrammes. The blood pressure should be taken in the standing position half an hour and one hour after the injection until the patient's condition was standardized.

Dr. Hayden said that he had two patients in whom the tolerance to the drug had decreased, so that only half the previous dose was now necessary. Because of variations in sensitivity the most successful patients were, as in diabetes, those with good intelligence.

#### Some Clinical Aspects of Hiatus Hernia.

DR. LUKE MURPHY presented patients and a series of case reports together with X-ray films illustrating some of the clinical presentations of hiatus hernia. By means of X-ray films and diagrams he illustrated the "sliding" and "rolling" types of hernia as described by Allison. Emphasis was laid on the incompetence of the valvular mechanism at the cardiac orifice in the "sliding" type resulting in œsophageal reflux of gastric content. The mechanism of the obstruction found at the œsophagogastric junction in some cases of the "rolling" type was illustrated.

Patients and case records were presented by Dr. Murphy to demonstrate the following clinical presentations of this condition.



*Dyspepsia.*

A female patient, aged fifty-six years, gave a two years' history of burning epigastric pain rising into the chest and throat, worst before breakfast and when she lay down at night. It was aggravated by the eating of fatty foods and eased by the taking of alkaline powders. There had been considerable flatulence and frequent dry retching. On a few occasions she had vomited a few streaks of blood and some mucus. She had been investigated three years earlier and told that she was suffering from nervous dyspepsia. Examination of the patient revealed no abnormality, but examination by means of a barium meal revealed a small hiatus hernia of the "sliding" type with pronounced oesophageal reflux.

Dr. Murphy stressed the frequency with which that type of condition was diagnosed as chronic cholecystitis, chronic appendicitis or nervous dyspepsia.

*Chest Pain.*

A man, aged fifty-eight years, had given a history of dull lower substernal pain of two days' duration; the pain fluctuated slowly in intensity, but did not radiate. It was accompanied by sweating and dry retching. For some years he had experienced a similar but less severe pain, appearing as he walked to the tram stop in the mornings and disappearing when he sat down. It appeared again after the evening meal, particularly if he exerted himself. He became dyspnoeic on moderate exertion. Examination of the patient showed him to be obese and slightly hypertensive, but otherwise normal. X-ray examination with a barium meal revealed a moderate-sized "sliding" hiatus hernia, while an electrocardiogram was normal.

Dr. Murphy remarked that the similarity between that story and that of cardiac pain required little comment.

*Hiatus Hernia as an Incidental Finding.*

Dr. Murphy said that hiatus hernia was a relatively common condition and that it was usually asymptomatic. Therefore its discovery did not necessarily furnish an explanation of the patient's symptoms, as the following case report demonstrated. A man, aged sixty-three years, was known to have had a hiatus hernia for some years. He suffered an occasional burning sensation beneath the lower part of the sternum on retiring to bed and had frequent flatulence after meals. Vomiting was uncommon. He was suddenly seized one evening with a severe pain in the same region, which rendered him pale and caused him to collapse. He vomited several times before the pain disappeared after a period of an hour. An electrocardiogram showed a fresh anterior cardiac infarct.

*Classical Clinical Picture of Hiatus Hernia.*

A copy of Allison's description of a hypothetical case in which he had embodied all the typical symptoms was presented. This description may be read in *Surgery, Gynecology and Obstetrics* for April, 1951.

*Hæmatemesis.*

A female patient, aged seventy-five years, was admitted to Saint Vincent's Hospital for operative treatment of a fractured femoral neck. Several weeks after the operation she suddenly vomited several ounces of bright red blood. Small hæmatemeses and melæna continued for several days, necessitating blood transfusion, although her general condition changed but little. The patient had for many years had a feeling of abdominal distension and an ache in the lower part of the chest about an hour after meals. She frequently vomited after meals and sometimes after only a few mouthfuls of food. She had been radiologically examined two years previously, being told that her stomach was normal, but that she had a slightly diseased gall-bladder. There were no significant findings on physical examination, while examination by means of a barium meal revealed a moderate sized "sliding" hiatus hernia. There was no evidence of other lesions of the stomach or duodenum.

It was suggested that the hæmorrhage in these cases was usually from the herniated portion of the stomach. However, series of X-ray films were produced to show that duodenal ulcer was not infrequently associated with hiatus hernia and might at times be the cause of hæmorrhage. Dr. Murphy indicated that slow bleeding from a hiatus hernia could produce microcytic hypochromic anaemia, and that that cause of such anaemia should be borne in mind in cases of slow gastro-intestinal bleeding of obscure origin.

*Dysphagia.*

A female patient, aged sixty-nine years, said that twelve months previously a piece of bread crust had stuck in her throat causing considerable distress. It passed on, but she vomited a little blood immediately afterwards. Thereafter she had progressively increasing difficulty in swallowing solid food, frequently regurgitating it with copious white mucus. She was unable to satisfy her hunger and lost weight steadily. She would admit to no other symptoms referable to the digestive tract before or after the onset of dysphagia. Examination of the patient revealed a considerable degree of wasting. A barium meal examination revealed a "sliding" type of hiatus hernia with considerable stenosis of the lower part of the oesophagus. A thoracotomy showed that the stenosis was due to fibrosis of the oesophageal wall. During discussion it was suggested that that condition might have been due to a congenitally short oesophagus. Dr. Murphy again quoted Allison as stating that the matter could be finally decided only at operation, and that in Allison's experience with a large series of such cases only a very small proportion had been due to congenital shortening of the oesophagus.

*X-Ray Films.*

A series of X-ray films were presented to illustrate the infrequency with which the hernia was seen on a plain film. However, films were set out showing a hiatus hernia as a large oval swelling in the chest of a child, and in another case appearing like a gas-filled cyst projecting from behind the right border of the heart. The films of Dr. Hayden's first patient were presented to stress the necessity of examining a patient under suspicion of hiatus hernia in the horizontal or Trendelenburg position. A series of films taken in 1949 of patients in the upright position showed no hiatus hernia, while a series taken in 1952 with the patients in the Trendelenburg position showed the sliding hernia very clearly.

*Ophthalmological Conditions.*

DR. KEVIN O'DAY presented a series of patients to demonstrate some of the more commonly encountered ocular diseases, in addition to groups of patients to demonstrate conditions less often seen. He also showed a selection of microscopic specimens from the ophthalmological section of the hospital department of pathology.

*Heterochromic Cyclitis.*

Among the patients to be presented there were two with heterochromic cyclitis, both showing typical non-pigmented keratic precipitates and one with a complicated cataract.

*Congenital Ocular Lesions.*

The next two patients demonstrated congenital ocular lesions. One was a girl, aged eight years, with a coloboma of the iris, ciliary body and choroid. There was a bridge of tissue over the iris defect. The other was a man, aged twenty-two years, who had reported for routine examination of the eyes and was found to have defective vision in the left eye. Examination of the eye revealed a fold of retina extending out to the periphery and terminating in a globular white mass. This was considered to be a case of congenital retinal fold due possibly to an adhesion between the primary vitreous and the inner wall of the optic cup.

*Retinopathy.*

Two patients were shown to demonstrate commonly seen types of retinopathy. The first patient had arteriosclerosis with retinal changes. The arteries were thickened and tortuous and varied in calibre with arterio-venous nipping. There were scattered hæmorrhages, both punctate and flame-shaped, and patches of white exudate. The second was a diabetic patient with typical diabetic retinopathy. There were punctate retinal hæmorrhages (aneurysms) and patches of wax-like exudate at the posterior pole.

*Retinitis.*

Dr. O'Day next presented a man, aged twenty-eight years, with *retinitis pigmentosa*. Ten years earlier this man had been treated at another hospital by right-sided cervical sympathectomy, and he now exhibited the signs of Horner's syndrome with miosis, ptosis and enophthalmos. Although the visual fields were contracted down to the 5° meridian with a ten millimetre object at two metres, the vision was still normal.

Dr. O'Day then showed a second patient, who had undergone sympathectomy. This was a woman, aged forty-four years, who had been examined two years earlier when her blood pressure had been 210 millimetres of mercury, systolic, and 140 millimetres, diastolic. At that time there were bilateral papilloedema, arterio-venous nipping, scattered haemorrhages and soft retinal exudates. Examination of the right macula revealed an early star figure. The vision was normal. Bilateral sympathectomy had been performed by Dr. F. Morgan in June, 1950. At the time of the meeting there was no papilloedema, but Dr. O'Day pointed out that there was a definite macular fan on each side and the outline of the optic disks was not defined. Occasional small haemorrhages and some peripheral exudate were present. The general appearance was that of retinitis which had subsided. The vision was still normal. The blood pressure was 215 millimetres of mercury, systolic, and 130 millimetres, diastolic.

#### Glaucoma.

A case of glaucoma was presented for diagnosis. The patient was a man, aged forty-five years, who had reported six weeks earlier with a painful left eye. The tension was high, with corneal oedema and the pupil distorted into an oblique slit running from the two o'clock meridian towards seven o'clock. The fundus at that time had not been perceived clearly, but well enough to be sure that there was no venous thrombosis. The tension was not controlled by miotics, and after ten days a La Grange sclerectomy with a broad iridectomy was performed. The tension was controlled somewhat better after operation, but it was still over 30 millimetres (Schiotz), and pronounced corneal oedema was still present. This obscured the fundus. The iris removed at operation had been cut into sections and examined. The specimen was on view at the demonstration, but nothing conclusive was made out, although the anterior border layer appeared to be thicker than normal. The visual field was normal to confrontation, and transillumination gave negative findings. In the discussion of the case the presence of an intraocular foreign body was suggested. It could not be detected on the X-ray films. Amongst other possibilities essential atrophy of the iris and intraocular tumour were put forward. The latter suggestion was still receiving attention.

#### Microscopic Sections.

Dr. O'Day next demonstrated a series of microscopic sections. There was a flat section of a whole retina from a case of arteriosclerotic retinitis stained in accordance with the technique of Hotchkiss-McManus. The next section was from an eye with a malignant melanoma of the iris in a man, aged sixty years. The tumour was of the nodular type projecting into the anterior chamber, but with little tendency to infiltrate the surrounding tissues. In contrast to this tumour was the next case of a malignant melanoma of the iris in a man, aged thirty years. This tumour was widely infiltrating, and because of the appearance of the cells was of the type often referred to as a carcinoma of the iris.

Dr. O'Day then went on to show two post-mortem sections. The first was from an eye in a case of torulosis to demonstrate papilloedema in yeast abscess of the brain. The second specimen showed optic atrophy consecutive to papilloedema.

Dr. O'Day's last section was from a deeply pigmented epithelioma of the ciliary body. This was a tumour of the pigmented ciliary epithelium, which presented as a dark mass pushing the iris forward in one quadrant. The growth was composed of convoluted masses of pigmented epithelial cells arranged in two layers and supported by a vascular stroma. There was no tendency to invade the tissues of the ciliary body or of the iris. The growth was confined to the epithelial layer. This tumour was to be distinguished from the nodules of hyperplasia of the ciliary epithelium occasionally seen in globes from which sections were cut in routine pathological examinations.

#### Orthopaedic Conditions.

The members of the Orthopaedic Clinic, DR. W. R. GAYTON, DR. MALONEY, DR. GRANT and DR. O'BRIEN, presented patients demonstrating various orthopaedic conditions.

#### "Car Elbow" Type Fractures.

The first patient shown was a male, aged thirty-nine years, who had sustained a compound fracture dislocation of the right elbow and a compound fracture of the right humerus; in addition the ulna had been severed high in the arm. He was treated by immediate arthroplasty and delayed suture of the ulnar nerve.

The second patient was a male, aged fifty years, who had sustained a compound fracture dislocation of the right elbow and had been treated by Zeno's traction.

The third patient was a male, aged forty-eight years, who had sustained a compound fracture of the humerus. Non-union had developed. A Kuntschner nail had been inserted, and union had resulted.

#### The Use of Refrigerated Homogenous Bone.

A male patient, aged thirty-five years, had an ununited fracture of the right femur of five years' duration. Two procedures had been tried, a sliding graft and an onlay graft, both unsuccessfully. He was treated with a Kuntschner nail and a homogenous bone graft, and union resulted.

X-ray films only were shown of a patient who had a large defect in the right tibia following a compound fracture. He had been treated by a massive homogenous cortical graft of tibia to fill the defect.

A third patient, a male, aged forty years, had had an ununited compound fracture of the right tibia and fibula, which had been treated with a homogenous bone graft.

A male patient, aged thirty years, was shown to demonstrate a new method of arthrodesis of the wrist by the insertion of a screw from the radial styloid into the capitate, as described by Robert Robinson and Daniel Kaygetz.

A married female patient, aged twenty-six years, suffering from gross spondylolisthesis, had been treated by spinal bone graft.

A boy, aged fifteen years, was shown, who was suffering from spasmodic *pes valgus* due to bony calcaneo-navicular bar.

#### A Case for Diagnosis.

A boy, aged fifteen years, was shown for diagnosis. He had presented with a cystic swelling of the lower end of the left fibula in the epiphysis with thickening of the peroneal sheath. The diagnosis made varied between chondroma, giant-cell tumour of bone and tuberculosis. At operation the microscopic appearances were those of a synovium; but histological examination showed the condition to be tuberculosis.

#### Fractures of Cervical Vertebrae.

X-ray films only were shown of a male patient, aged fifty-six years, who had sustained a fracture dislocation of the cervical part of the spine, and a fracture of the odontoid process with forward displacement of the first cervical vertebra. He had been treated with traction by means of a Crile collar.

An unmarried female patient, aged thirty years, had sustained a fracture of the odontoid process, which had been treated by traction with Crutchfield tongs and a Crile collar, and immobilization with a Zimmer collar.

A male patient, aged forty-one years, had sustained a fracture of the arch of the atlas and a fracture of the spinous process of the sixth cervical vertebra. He had been treated with Crile's traction, and later immobilized in a Zimmer collar with extension.

#### Miscellaneous Conditions.

A male patient, aged thirty-two years, had undergone patellectomy, and had a full range of knee movement some weeks after operation.

A male patient, aged twenty-four years, had sustained a compound fracture of the right tibia and fibula and an unreduced anterior dislocation of the ankle joint. He had been treated by plating of the tibia and arthrodesis of the ankle as a delayed procedure.

A male patient was shown who had sustained a Monteggia fracture, with spontaneous reduction and stability requiring no immobilization.

A male patient, aged thirty-three years, had sustained bilateral fractures of the mandibular condyles, and had been treated by bilateral excision of mandibular condyles.

#### The Resectoscope in Urological Surgery.

DR. HENRY MORTENSEN and DR. LEONARD MURPHY presented a demonstration on the use of the resectoscope in urological surgery. They gave a review of 1628 cases of bladder neck obstruction, some 14% of which were due to carcinoma of the prostate. Of those patients operated upon, 80% were dealt with by endoscopic resection with an overall mortality

rate of 3%. A review of the various age groups of those treated proved that 22% were aged seventy-five years and over, the oldest patient being aged ninety-two years. In this group the mortality rate rose to 4%. One hundred and forty-seven patients below the age of sixty years were operated on without any death.

The use of the infant resectoscope of a similar type in cases of neurogenic or obstructive disease in childhood was demonstrated. It was pointed out that obstructive lesions of the bladder neck in females were more common than was realized and were easily and effectively dealt with by means of endoscopic resection.

The comment was made that in bladder tumours the resectoscope was of the greatest value as a method of taking biopsy specimens. Simple papillary tumours were best dealt with by that method, via the urethra, the surface of the tumour being looped off and the base coagulated. By radical removal of tissue with the resectoscope in carcinomata of the bladder, results equal to or better than those achieved by the more radical procedures of ureteric transplantation and total cystectomy might be obtained.

#### Dermatological Conditions.

DR. DENIS CLARKE showed six patients suffering from conditions of dermatological interest. The first was a male, aged thirty-five years, who had a six months' history of generalized exfoliative dermatitis. He had received full dosage of ACTH for two months and subsequently cortisone by mouth for six weeks. This had proved life-saving, but continued treatment with one or other hormone appeared essential. The case was apparently one of the "primary" type.

Dr. Clarke also showed two patients suffering from psoriasis, one with coincident *acne vulgaris*, the other with the seborrhoeic distribution of psoriasis. Two female patients were shown suffering from *lichen planus*, in one case restricted to the buccal mucosa, in the other of generalized distribution. The diagnostic features were demonstrated. Dr. Clarke's last patient had a black hairy tongue, apparently the result of penicillin powder reaching the mouth via an imperforated ear-drum. That patient had also responded to sulphapyridine therapy for *dermatitis herpetiformis*.

(To be continued.)

#### NEW SOUTH WALES BRANCH NEWS.

THE Section of Neurology, Psychiatry and Neurosurgery of the New South Wales Branch of the British Medical Association will be holding a clinical meeting with demonstration of cases at Broughton Hall Psychiatric Clinic on Thursday, 12th March, 1953, at 2.15 p.m. All members of the medical profession are invited.

#### Out of the Past.

In this column will be published from time to time extracts, taken from medical journals, newspapers, official and historical records, diaries and so on, dealing with events connected with the early medical history of Australia.

#### THE ESTABLISHMENT OF VACCINE INSTITUTIONS.<sup>1</sup>

Colonial Secretary's Office,  
Sydney,  
27 Sept., 1853.

The Medical Adviser to the Government.

Sir,

I do myself the honor to acknowledge receipt of your letter of 21st instant and having submitted your communication to the Governor General I am directed to inform you that His Excellency approves as recommended by you the following arrangements for establishing Vaccine Institutions at the following places, viz.:

1st. Dr. Foulis to have charge of the Establishment in the South part of the City and to attend at the Benevolent Asylum every week day from 2 p.m. until 5 p.m. in a room

<sup>1</sup> From the original in the Mitchell Library, Sydney.

which the Committee have expressed their willingness to appropriate to the purpose.

2. Mr. Surgeon Ward to have charge of the suburbs and to attend at Balmain on Mondays and Thursdays from 2 until 5 p.m. and similarly at Pyrmont on Tuesdays and Fridays and at the North Shore on Wednesdays and Saturdays.

3. These vaccinators as well as Dr. Rutter who has charge of the present Establishment and should be present at his room every Week day from 2 p.m. to 5 p.m. are to make personal visitations at the houses in their respective divisions of the City and Suburbs in order that they may assure themselves that the Inhabitants have been brought under the influence of the Vaccine protection. You will be pleased therefore to instruct them accordingly.

4. A Communication has been addressed to the Denominational School Board requesting that the Parish School room in Balmain, Pyrmont and the North Shore may be allowed on the days mentioned for the purposes of Vaccination.

5. It is proposed as recommended that gratuitous vaccination shall be performed two days in each week at Parramatta, Maitland, Bathurst, Goulburn, Brisbane, Wollongong, Newcastle, Windsor, Macquarie and that the Court Houses should be appropriated to the purpose, it has however been considered proper to write to the Benches of magistrates in the Districts mentioned in order that they may have an opportunity of expressing any objection which they may entertain to this course or to state the time in which the Court can be most conveniently allowed.

6. Mr. Surgeon Faulder is, under your recommendation, appointed to perform the duty at Illawarra and His Excellency has appointed Mr. Michael McCartney to be vaccinator at Maitland—at Parramatta, Bathurst, Goulburn and Brisbane the surgeons of the Gaols will be appointed to perform the duty and for Newcastle, Windsor and Macquarie you will be pleased to nominate persons for the office for His Excellency's approval.

7. The notice forwarded in your letter will be published in the next Government Gazette and the appointments for the Country Districts will also be published as soon as the necessary information has been obtained as to the time when the vaccination can be performed.

I have, &c.,

W. ELYARD.

#### Correspondence.

##### A SERVICE FOR DIABETICS.

SIR: The Diabetic Association of Australia is breaking new ground in a venture important to the medical profession and to the community. An experienced dietitian has been engaged, who will be available for consultation, by appointment, to private patients of doctors. She will explain the diet sheets which have been prescribed for them, discuss specific difficulties that may occur, and advise on the innumerable details of diet that frighten the new diabetic and puzzle the old one.

The dietitian, Mrs. Venn-Brown, is an associate member of the Institute of Dietitians and has had wide experience in hospital and public health work. She will be in attendance one day a week at the office of the Diabetic Association, 166 Phillip Street, Sydney, from Friday, February 27, and every succeeding Friday. Information as to fees and office hours may be obtained by telephone (BW 3432) or by letter (Box 4746, G.P.O., Sydney). The committee hope this service will commend itself to the profession.

Yours, etc.,

(Miss) RUBY W. BOARD,  
President, The Diabetic Association of  
Australia.

Box 4746,  
G.P.O.,  
Sydney.  
February 5, 1953.

##### HISTOPLASMOSIS.

SIR: In the report "Review of Histoplasmosis" (M. J. AUSTRALIA, January 31, 1953, page 138) by J. A. Inglis and R. E. Powell, and "A Case of Histoplasmosis" by J. B. Dowe *et alii*, page 142, it is stated that there is no treatment for this condition. May I draw the authors' attention to the adminis-



tration of ethyl ester of vanillic acid (ethyl vanillate) in doses of 250 milligrammes per kilogram of body weight per day in divided doses? This therapy has been reported as being effective in five cases out of twelve patients.

Yours, etc.,

MICHAEL ELYAN.

Townsville,  
Queensland,  
February 5, 1953.

# ACUTE NECROSIS OF THE PANCREAS (ACUTE HÆMORRHAGIC PANCREATITIS) CAUSING AND PRESENTING AS AN ACUTE COLONIC OBSTRUCTION.

SIR: Dr. T. F. Rose in his interesting case report of acute necrosis of the pancreas causing and presenting as an acute colonic obstruction (M. J. AUSTRALIA, January 31, 1953) does not appear to appreciate the value of the serum amylase in the diagnosis of acute pancreatitis.

From a personal study of the serum amylase level in over 200 cases of abdominal pain (including 34 cases of acute pancreatitis), I have found that if carried out within forty-eight hours of the onset of the attack, a value above 1000 units indicated acute pancreatitis (the test being done according to the Somogyi modification of the Wohlgemuth technique). After forty-eight hours, the level has quite often returned to normal; so that a test done then is often useless as a positive diagnostic aid. In the case reported, this test was apparently done six or seven days after the onset of the attack, and thus nothing could be inferred from the normal level obtained.

Secondly, I have found that the serum amylase is usually raised above 1000 units for the first two days of attack, whether it be pathologically the necrotic or oedematous type of acute pancreatitis. In the acute necrotic type the level was found to fall very quickly, while in the oedematous type it sometimes took over two weeks to return to normal.

Yours, etc.,

GERALD BROSNAN.

55 Collins Street,  
Melbourne, C.I.,  
February 6, 1953.

## Post-Graduate Work.

THE POST-GRADUATE COMMITTEE IN MEDICINE IN THE UNIVERSITY OF SYDNEY.

### Clinical Meetings at Balmoral Naval Hospital.

THE Post-Graduate Committee in Medicine in the University of Sydney announces that the following lectures will be delivered at clinical meetings at the Balmoral Naval Hospital at 2 p.m.:

Tuesday, March 17: "Surgical Treatment of Abdominal Hernia", Dr. H. Cumberland.

Tuesday, April 14: "Vascular Diseases in General Practice", Dr. C. G. McDonald.

Clinical cases will be shown after each lecture. All members of the medical profession are invited to attend.

## Medical Prizes.

### A PRIZE FOR RESEARCH IN INFERTILITY.

THE American Society for the Study of Sterility announces the opening of the 1953 contest for the most outstanding contribution to the subject of infertility and sterility. The winner will receive a cash award of one thousand dollars, and the essay will appear on the programme of the 1953 meeting of the Society. Essays submitted in this competition must be received not later than March 1, 1953. For full particulars concerning requirements of this competition, address The American Society for the Study of Sterility, c/o Dr. Herbert H. Thomas, 920 South 19th Street, Birmingham, Alabama.

The author should append on a separate sheet of paper a short biographical sketch of himself and include a photograph to be used in the necessary publicity should he be the winner of the award.

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED JANUARY 17, 1953.<sup>1</sup>

Disease.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.	Australian Capital Territory.	Australia.
Acute Rheumatism .. ..	2(2)	1	..	..	..	..	..	..	3
Amoebiasis .. ..	..	..	..	..	..	..	..	..	..
Ancylostomiasis .. ..	..	..	..	..	..	..	..	..	..
Anthrax .. ..	..	..	..	..	..	..	..	..	..
Bilharziasis .. ..	..	..	..	..	..	..	..	..	..
Brucellosis .. ..	..	..	..	..	..	..	..	..	..
Cholera .. ..	..	..	..	..	..	..	..	..	..
Chorea (St. Vitus) .. ..	..	..	..	..	1	..	..	..	1
Dengue .. ..	..	..	..	..	..	..	..	..	..
Diarrhoea (Infantile) .. ..	6(6)	1(1)	14(10)	..	..	1	1	..	22
Diphtheria .. ..	9(5)	..	6	..	1(1)	2(1)	..	..	19
Dysentery (Bacillary) .. ..	..	4(2)	..	..	2(2)	..	..	..	6
Encephalitis .. ..	..	..	..	2(2)	..	..	..	..	2
Filariasis .. ..	..	..	..	..	..	..	..	..	..
Homologous Serum Jaundice	..	..	..	..	..	..	..	..	..
Hydatid .. ..	..	..	..	..	..	..	..	..	..
Infective Hepatitis .. ..	..	2	..	..	25(8)	..	..	..	27
Lead Poisoning .. ..	..	..	..	..	..	..	..	..	..
Leprosy .. ..	..	..	..	..	..	..	..	..	..
Leptospirosis .. ..	..	..	1	..	..	..	..	..	1
Malaria .. ..	..	..	..	..	..	..	..	..	..
Meningococcal Infection .. ..	4(2)	3	..	..	..	..	..	..	7
Ophthalmia .. ..	..	..	..	..	..	..	..	..	..
Ornithosis .. ..	..	..	..	..	..	..	..	..	..
Paratyphoid .. ..	..	..	..	..	..	..	..	..	..
Plague .. ..	..	..	..	..	..	..	..	..	..
Polomyelitis .. ..	24(7)	15(9)	7(2)	7(6)	..	10(1)	..	..	63
Puerperal Fever .. ..	..	60(48)	..	..	1(1)	..	..	..	61
Rubella .. ..	..	..	..	..	..	..	..	..	..
Salmonella Infection .. ..	..	..	..	..	..	..	..	..	..
Scarlet Fever .. ..	9(8)	15(11)	1	5	3(1)	1	..	..	34
Smallpox .. ..	..	..	..	..	..	..	..	..	..
Tetanus .. ..	..	..	1(1)	..	..	..	..	..	1
Trachoma .. ..	..	..	..	..	..	..	..	..	..
Trichinosis .. ..	..	..	..	..	..	..	..	..	..
Tuberculosis .. ..	35(31)	4(2)	65(57)	10(8)	12(8)	7(1)	..	1	134
Typhoid Fever .. ..	..	1(1)	..	..	..	..	..	..	1
Typhus (Flea-, Mite- and Tick-borne) .. ..	..	..	..	..	1(1)	..	..	..	1
Typhus (Louse-borne) .. ..	..	..	..	..	..	..	..	..	..
Yellow Fever .. ..	..	..	..	..	..	..	..	..	..

<sup>1</sup> Figures in parentheses are those for the metropolitan area.

## Medical Appointments.

Dr. B. B. Joyce has been appointed government medical officer at Mount Isa, Queensland.

Dr. J. H. Slade has been appointed honorary visiting medical officer (ophthalmological) to the Northfield Wards at the Royal Adelaide Hospital.

Dr. J. A. Ferris has been appointed honorary assistant anaesthetist at the Royal Adelaide Hospital.

Dr. G. T. H. Harris has been appointed chairman of the Board of Management of the Queen Victoria Maternity Hospital, Tasmania, and also as a representative of the Queen Victoria Maternity Hospital Association on the Board.

Dr. D. O. Jones has been appointed government medical officer at Laidley, Queensland.

Dr. W. D. Symes has been appointed registrar, Mareeba Babies Hospital, South Australia.

Dr. E. S. Morris has been appointed a member of the Board of Health of New South Wales.

Dr. David McMurray Carson has been appointed a quarantine officer at Albany, Western Australia, under the provisions of the *Quarantine Act, 1908-1950*.

tion: Allen, Thomas Howard; Harwood, John William; Connor, Brian Anthony; Jorgenson, Donald Murray; Stockbridge, John Keith; Paull, Colin Gordon; Evans, Kenneth Alan Greig; Last, Peter Murray; Gard, Jeanette Thrush Brentnall; Mill, James Crowe Davidson; Flower, Clifford James McKinnon.

## Diary for the Month.

- FEB. 24.—New South Wales Branch, B.M.A.: Ethics Committee.  
 FEB. 25.—Victorian Branch, B.M.A.: Council Meeting.  
 FEB. 26.—South Australian Branch, B.M.A.: Scientific Meeting.  
 FEB. 27.—Queensland Branch, B.M.A.: Council Meeting.  
 MARCH 3.—New South Wales Branch, B.M.A.: Organization and Science Committee.  
 MARCH 4.—Victorian Branch, B.M.A.: Clinical Meeting.  
 MARCH 4.—Western Australian Branch, B.M.A.: Council Meeting.  
 MARCH 5.—South Australian Branch, B.M.A.: Council Meeting.  
 MARCH 6.—Queensland Branch, B.M.A.: General Meeting.  
 MARCH 10.—New South Wales Branch, B.M.A.: Executive and Finance Committee.

## Corrigendum.

DR. HAROLD LOVE asks that attention be drawn to an error that has occurred in his Jackson Lecture, "History, Hypothesis, and the Heart", which appeared in the issue of February 7, 1953. On page 173, second column, in the first line of the third paragraph, the name "Paul Jones" should read "Paul Wood". Dr. Love regrets this mistake.

## Deaths.

THE following deaths have been announced:

DAVIS.—William Davis, on February 4, 1953, at St. Kilda, Victoria.

ERCOLE.—Quinto Ercole, on February 2, 1953, at Grenfell, New South Wales.

## Nominations and Elections.

THE undermentioned<sup>1</sup> have applied for election as members of the South Australian Branch of the British Medical Association:

Downing, Robert Gregory, M.B., B.S., 1952 (Univ. Adelaide), Keith, South Australia.

West, John Burnard, M.B., B.S., 1952 (Univ. Adelaide), 11 Fergusson Square, Toorak Gardens, South Australia.

Potts, John Louis, M.B., B.S., 1950 (Univ. Adelaide), Florence Street, Murray Bridge, South Australia.

Horton, Robert Ralph, 81 McArthur Avenue, Plympton, South Australia.

Davies, Norma Esther, 35 Partridge Street, Glenelg, South Australia.

Tonkin, David Oliver, 7 Hexham Avenue, Myrtle Bank, South Australia.

Harris, Digby Ian, "The Glen", Crafrers, South Australia.

Gillen, Robert Spencer, 19 Wellington Square, North Adelaide, South Australia.

Marshall, Janette Ruth Watson, 15 Partridge Street, Glenelg, South Australia.

Chappell, William Thomas, 303 Kensington Road, Kensington Park, South Australia.

MacBeth, William Andrew Alexander Greer, "St. Margarets", Aldgate, South Australia.

Page, Leland Ivor, Cleve, South Australia.

The undermentioned<sup>1</sup> have been elected as members of the South Australian Branch of the British Medical Association:

<sup>1</sup> With the exception of the first three applicants, these applicants and newly elected members qualified in December, 1952, at the examinations for the degree of M.B., B.S. (Univ. Adelaide), but the degrees had not been conferred at the time when their applications for membership were considered by the Branch Council.

## Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Medical Secretary, 135 Macquarie Street, Sydney): All contract practice appointments in New South Wales.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federal Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225 Wickham Terrace, Brisbane, B17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178 North Terrace, Adelaide): All Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205 Saint George's Terrace, Perth): Norseman Hospital: all Contract Practice appointments in Western Australia. All government appointments with the exception of those of the Department of Public Health.

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